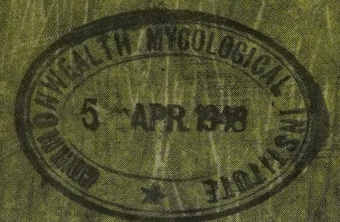


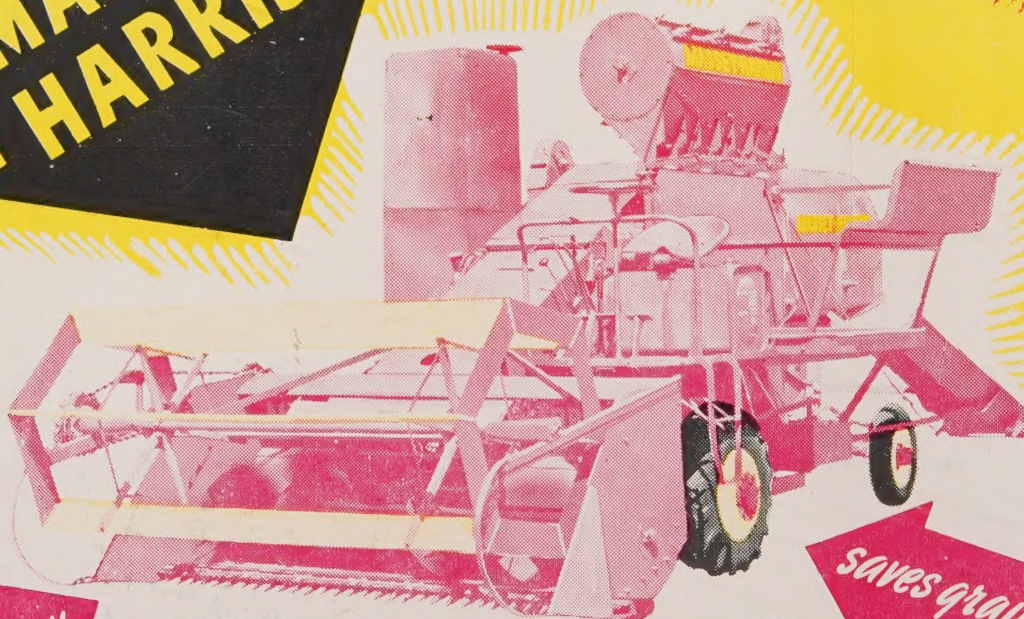
NEW ZEALAND
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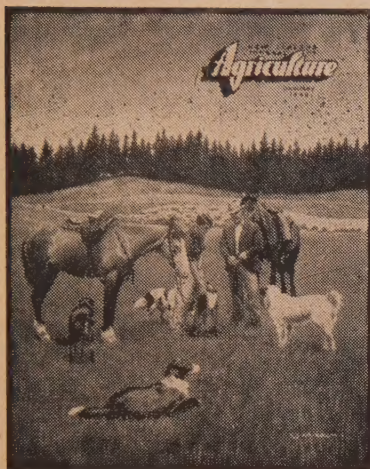
The "Service Arm" of the New Zealand Farm

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Hon. E. L. Cullen,
Minister of Agriculture.

This month's cover



A mustering scene on a New Zealand sheep farm has been painted for this month's cover from a photograph by Sparrow Industrial Pictures Ltd. Though the sheep industry in New Zealand was originally established for the export of wool and a little tallow, today, through the introduction of refrigeration, the production of sheep for meat has assumed greater importance. In the increased production drive to aid Britain the attainment of the Dominion's target of 565,000 tons of meat for the 1947-48 season will depend largely on the sheep industry.

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SUBSCRIPTION RATES

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GRASSLAND FARMING

The main wealth of New Zealand's primary production lies in grasslands, but the wealth that comes from grass could be doubled or trebled if every acre of grazing country were given the attention it deserves.



With sown grassland success begins with the sowing—and success in the sowing starts with preparation of the seed-bed.

NOW is the time to decide what areas are to be sown to grass this autumn, and now is the time to plan early cultivation work with the object of obtaining a fine but firm seed-bed.



Early cultivation should be deep and thorough, finishing off just before sowing with the use of a light harrow and the roller.

Time spent in cultivation pays handsome dividends.

**BETTER PASTURES MEAN GREATER PRODUCTION
OF VITAL FOOD FOR BRITAIN**

Cereal Production Targets Must be Reached



ESTIMATES recently published by the Government Statistician of the areas sown in cereals for threshing for the 1947-48 season are most disappointing, and unless the targets set for 1948-49 are reached New Zealand is likely to remain critically short of cereals. The wheat acreage for 1947-48 is estimated at only 122,000 acres,

but at least 200,000 acres were required to balance the Dominion's domestic needs with probable imports, which are strictly rationed by the International Emergency Food Council. For the 1948-49 season the target set in the Aid for Britain Campaign is 250,000 acres, and I feel that the time is opportune to emphasise the responsibility on farmers with wheat-growing land.

At this time of the year arable farmers must plan their cropping programmes for the following season, and the wheat target acreage can be achieved only if each farmer breaks up some additional land. In short, arable farmers must aim at a slightly-greater cropping programme than that which they accomplished in the 1941-42 season, when the combined acreage for wheat, oats, and barley for threshing was 365,000 acres, of which wheat occupied 258,000 acres.

Targets for 1948-49

For the 1948-49 season the combined acreage required to be planted in cereals for threshing is 375,000 acres, made up as follows:—

	Acres
Wheat	250,000
Barley (malting)	50,000
Barley (feed)	15,000
Oats (threshing)	60,000

I feel that arable farmers could reach that target if each decided now to break up additional land for cereal production. They alone have the land suitable for such production, labour, machinery, and fertilisers are more plentiful than they were in the critical war years, and the basic price of 8s. a bushel (with provision for adjustment in the event of any increase in the cost of production) will ensure satisfactory returns.

The need for maintaining cereal production is just as great now as it was during the war. World supplies are still critically short, as is shown by the report of the Special Cereals Conference, which met in Paris in July, 1947. This report stated that information available then showed estimated supplies for export from all sources at 32,000,000 tons (26,000,000 tons of wheat and rye and 6,000,000 tons of coarse grains), while the grain requirements of importing countries

were 44,000,000 tons for food and 6,000,000 tons for feed, indicating a deficiency of 18,000,000 tons. Though the data furnished at that conference were not firm estimates, there is no doubt that for 1947-48 there will be a very serious world deficiency of cereals.

If New Zealand's campaign for food production is to be successful, it must be a balanced effort and emphasis on meat and dairy produce must not obscure the need for increased cereal production. The Aid for Britain Campaign does not ask for any major change to cereal production but merely for a return to the cropping programme carried out in the early years of the war. I was impressed by a statement in a recent report of the Wheat Research Institute which shows that, contrary to general opinion, it is the heavy land and not the light land which goes out of production when the wheat acreage declines. Therefore it is to farmers with heavy land that I feel I must make a particular appeal for a return to their cropping programmes of the 1940-42 period, when the wheat area averaged more than 250,000 acres. Wheat prices are based on the cost of production for average yields, but on heavy land the yields are usually above average, so farmers on such land should gain financially by returning to wheat production.

Decisions Must be Made Now

Finally, I must stress again the important point that farmers must make their decisions about increased wheat acreage for 1948-49 now. The additional cropping areas can be obtained only by breaking up grassland, and for wheat the turf must be broken up in the summer or very early autumn. Any delay now means that the target will not be reached.

Every effort should also be made to reach the acreage needed in oats and barley for threshing or the country's domestic needs for these cereals cannot be met. The barley acreage for 1947-48 appears to have been reached, but the area for oats has not. To meet the targets for 1948-49 the increased wheat acreage must come from freshly-broken land and must not displace oats and barley in the normal crop rotation.

These are critical times and, though New Zealand farm lands in general are most suited to the production of meat and dairy produce from grass, the fact that the Dominion has certain definite obligations in cereal production must not be lost sight of. The Aid for Britain Campaign has set targets for all types of production and they appear to be fairly certain of accomplishment with the exception of those for cereals. I feel that now arable farmers really appreciate the position the targets set for 1948-49 will be reached. They met them in the early war years and will, I believe, do so now when the need for production is just as important as it was then.

EDWARD CULLEN, Minister of Agriculture.

LIME TRANSPORT ASSISTANCE

A NEW basis of lime freight assistance by rail and road was announced recently by the Minister of Agriculture (the Hon. E. Cullen). Under the new arrangement the farmer will pay the full freight for the first 15 miles on lime transported by rail and thereafter be entitled to assistance at the rate of 50 per cent. on railrage charges for the remaining distance, whatever the distance may be. If in addition to rail transport lime must be carted by road, there will be an allowance of 4d. a mile on road cartage for every mile beyond the first three from the consignee's nearest railway station to the farm gate. Where rail transport is not required, and generally this will occur only where there is no available rail route, the 4d. a mile on road transport distance after the deduction of three miles from the consignee's nearest lime works to the farm gate will be granted.

The Department of Agriculture is administering the lime assistance plan, which is retrospective to November 24, 1947, and remains in operation until July 31, 1948. At the request of farmers' organisations the whole plan will be reviewed in July, 1948. Benefits under the plan for lime consigned to farmers between November 24, 1947, and January 4, 1948, will be paid to those concerned by the Department of Agriculture by arrangement with the suppliers.

The Department of Agriculture has undertaken to pay the concessions under the plan to the lime suppliers and to the Railways Department, who in turn will allow corresponding credits to farmers. Farmers are therefore not required to make claims, but must furnish road cartage declarations to lime suppliers when placing their first orders.

There is to be strict compliance with the rules governing the plan.

Rules for Assistance

Consignments of New Zealand agricultural lime for use in dressing land used bona fide as a farm, orchard, nursery, or market garden within the Dominion of New Zealand may qualify for lime transport assistance (referred to hereinafter as L.T.A.).

The qualification for lime transport assistance is that the consignee is a bona fide farmer, orchardist, nurseryman, market gardener, educational institution whose curriculum requires the carrying on of farming for the purposes of instruction of its students, or other organisations approved by the Director-General of Agriculture from time to time, and that the consignment is solely for use on the land occupied by the consignee for farming purposes. Such consignees will be referred to hereinafter as with L.T.A.Q. (lime transport assistance qualification).

Extent of Assistance

Assistance to consignees with L.T.A.Q. is governed primarily by use of rail service where available, and in conformity with rail minimum load provision (i.e., 6 tons, etc.), and they will be granted the New Zealand Railways' lime rates gazetted as effective from January 5, 1948. In addition, after rail journey to the nearest railway station, there may be a credit

of 4d. per ton mile on the road transport distance to the farm gate reduced by three miles.

To all other consignees with L.T.A.Q. where rail service is not available, or where the distance by the available rail route plus the road journey from the nearest railway station to the farm gate would be greater by more than one-third than the shortest road route available, or where the distance from the nearest lime works direct to farm gate does not exceed 30 miles, there may be a credit of 4d. per ton mile on the road transport distance from said lime works to farm gate reduced by three miles.

Definitions

Use of rail service means the consignment by rail from the railway station of the lime supplier to the nearest railway station of the consignee's farm land.

Lime supplier means the proprietor of a lime works approved by the General Manager of New Zealand Railways for supply of lime from that lime works at L.T.A. rates, and by the Director-General of Agriculture where the lime supplier has no rail service available for rail dispatch of his lime.

Road transport distance after rail journey means the mileage by the shortest route from the nearest railway station to the farm gate.

Road transport distance without rail journey means the mileage by the shortest route from the nearest lime works to the farm gate.

Farm gate means the main entrance gate on the public road serving the farm lands.

Consignee means the occupier with L.T.A.Q. in respect to the farm lands on which the lime is to be used for farming purposes.

Consignor means the lime supplier whether consignment is forwarded by rail or road in respect to L.T.A.Q. consignees.

Responsibility of everyone with L.T.A.Q. (Farmers, etc.)

1. To ascertain that he is ordering his lime from an approved lime works and to see that

his order complies with the minimum load (6 tons, etc.) requirements of the New Zealand Railways.

2. To give notice to his lime supplier that he has L.T.A.Q. if his order entails railrage without road transport assistance. (This applies where the farm gate is within the three-mile limit from nearest railway station.)

3. To satisfy his lime supplier as to the mileage on which he is entitled to road transport assistance not later than when he places his first order. (He accomplishes this by the completion of No. 1 L.T.A. Declaration if delivery is by rail and thereafter by road, and by No. 2 L.T.A. Declaration if delivery is by road only. Forms are available from offices of the Department of Agriculture and from lime suppliers. On the declaration forms there is provision for signature, qualification (farmer, orchardist, etc.), postal address, and the witnessing of the signature by a ratepayer.)

Settlement of L.T.A. Credits

All L.T.A. consignments through the New Zealand Railways will have the appropriate road transport assistance credited against the railrage charge, except that in the event of the road allowance being in excess of the railrage charge the New Zealand Railways will charge no railrage and notify the Department of Agriculture of the balance of the road allowance due and the consignee will be paid by the Department of Agriculture within 30 days.

All other L.T.A. consignments will have the appropriate road transport assistance credited against the cost of the lime by the lime supplier.

Warning

The overstatement of mileage declared for road transport assistance or other incorrect statements in respect to lime consignments by the consignee will disentitle him to all benefits applicable to the consignments concerned without prejudice to other legal redress.

Failure by the consignee to provide the lime supplier with the L.T.A. Declaration will preclude the lime supplier from granting, or authorising the New Zealand Railways to grant, lime transport assistance (L.T.A.) by road.

SPECIMEN DECLARATIONS

Complete either No. 1 or No. 2 Declaration, as appropriate, and forward to Lime Supplier with first order.

No. 1 LIME TRANSPORT ASSISTANCE DECLARATION (Delivery by Rail and Road)

I, (Full name in block letters), am aware of the rules governing road transport allowance and that this allowance is based, where delivery is by rail and road, on distance by the shortest route from my nearest railway station to the main entrance gate of my farm land reduced by three miles and that on this basis my allowance will be.....miles at 4d. per ton mile.

Accordingly, I hereby declare that my farm land is situated at.....; that my nearest rail point is.....Railway Station (or Flag Station); that all lime consigned to me by rail will be solely for use on the said farm land; and that on all orders for such lime the road transport allowance distance (i.e., excluding three miles as above) will be correctly stated by me in a manner satisfactory to my Lime Supplier.

I appreciate that in the event of incorrect statement of allowance distance or other facts by me in respect of my lime consignments I lose all benefits (rail and road) applicable to the consignments concerned.

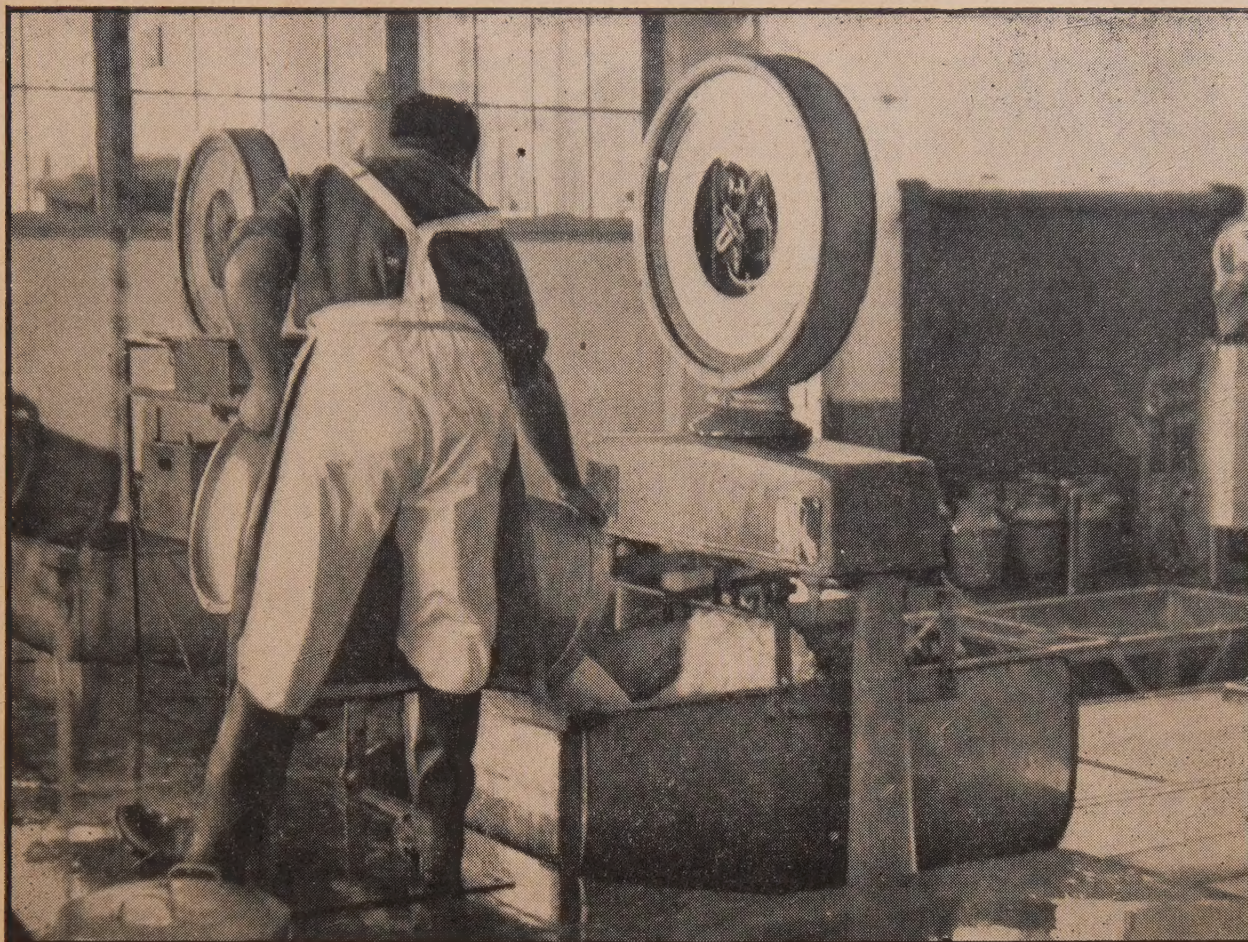
No. 2 LIME TRANSPORT ASSISTANCE DECLARATION (Delivery by Road Only)

I, (Full name in block letters), am aware of the rules governing road transport allowance and that this allowance, where delivery is by road only, is based on distance by the shortest route from the works of my nearest Lime Supplier to the main entrance gate of my farm land reduced by three miles, and that on this basis my allowance will be.....miles at 4d. per ton mile.

Accordingly, I hereby declare that my farm land is situated at.....; that it is miles from my farm gate to the nearest rail point, which is.....Railway Station (or Flag Station); that the distance by road from my farm gate to the Lime Works (nearest approved Lime Supplier) is.....miles; that the lime consigned to me will be solely for use on the said farm land; and that conveyance by rail and road would involve a journey more than one-third greater than the distance from the said farm gate to the said works.

I appreciate that in the event of incorrect statement by me of distances or other facts in respect to my lime consignments I lose all benefits applicable to the consignments concerned.

Note: To secure Road Transport Allowance you must provide your Lime Supplier with which-ever of the above Declarations is appropriate. He cannot arrange Road Transport Allowance without it.



THE COLLECTION AND PROCESSING OF MARKET MILK

By T. P. J. TWOMEY, *Superintendent of Market Milk Production, Dairy Division, Wellington.*

from the association over a term of years, letting the half-penny allowance meet the cost.

SOME aspects of the production of market milk were dealt with in an article in the December issue of the "Journal." The subject is developed in this article, which deals with the milk from the time it leaves the farm dairy until it is processed in the milk-treating house.

Where milk is cooled by refrigeration to 40 degrees F., once-a-day collection from the farm can be practised with perfect safety, but where milk is cooled by water only, twice-a-day collection is frequently necessary in hot, humid weather.

IT is desirable that all milk produced for the town milk trade should be cooled by mechanical refrigeration. The temperature usually desired is 38 to 40 degrees F., as at this stage of coldness the growth of bacteria in the milk is very greatly retarded. In New Zealand the Government has appreciated the need for this refrigeration on the farm and pays a premium of a halfpenny a gallon to help defray the cost of this process. In this they are following an enlightened policy, as in some other countries no such encouragement is given.

Twice-a-day collection is expensive and in Europe and America the businesslike plant manager endeavours to adhere to a once-a-day collection system. In New Zealand twice-daily collection is practised to a substantial extent in Auckland, though in Whangarei in North Auckland the once-a-day routine is giving excellent results, because the milk is collected from farms possessing mechanical refrigeration.

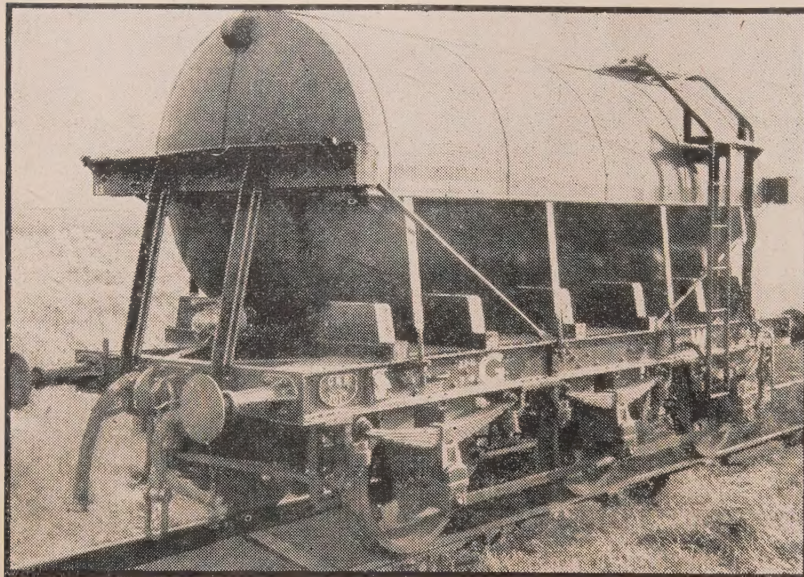
Admittedly the initial cost of a mechanical refrigerator for milk cooling is high and some producers dislike laying out the capital involved. However, one producers' supply association has attacked this problem in a novel manner and has purchased the necessary refrigerating equipment on behalf of those of its members who desire it, and the members in turn are now purchasing the individual plants

Collection and Haulage

Collection is done by motor lorry in almost all countries in the world. All types of vehicles are in use, from big road tankers hauling milk into large cities to the private car with a trailer behind hauling a couple of cans into a small dairymen's depot. The collection and haulage of milk have developed into big business, and in several countries the job is done by haulage contractors. This arrangement is logical, as the business of haulage is equally as specialised as that of milk processing.

[Heading photograph by Photo Services.]

COLLECTION AND HAULAGE OF MARKET MILK



A type of 3000 gallon single-compartment rail tanker in regular use on English railways.

In the bigger milk-treatment depots the organisation of milk collection routes has to be carefully planned. The routes followed by the trucks must be so arranged that the farm gate is not reached too early for the milk to be ready and not so late that the heat of the day is likely to affect milk already on the lorry. In a big, modern depot where milk may be collected from a thousand farms it is essential that it can be handled as fast as it is received, and to this end truck routes are so planned that the trucks follow each other into the depot at regular intervals. In a depot such as this the manager's office would contain a large wall map on which each farm supplying the depot would be marked out

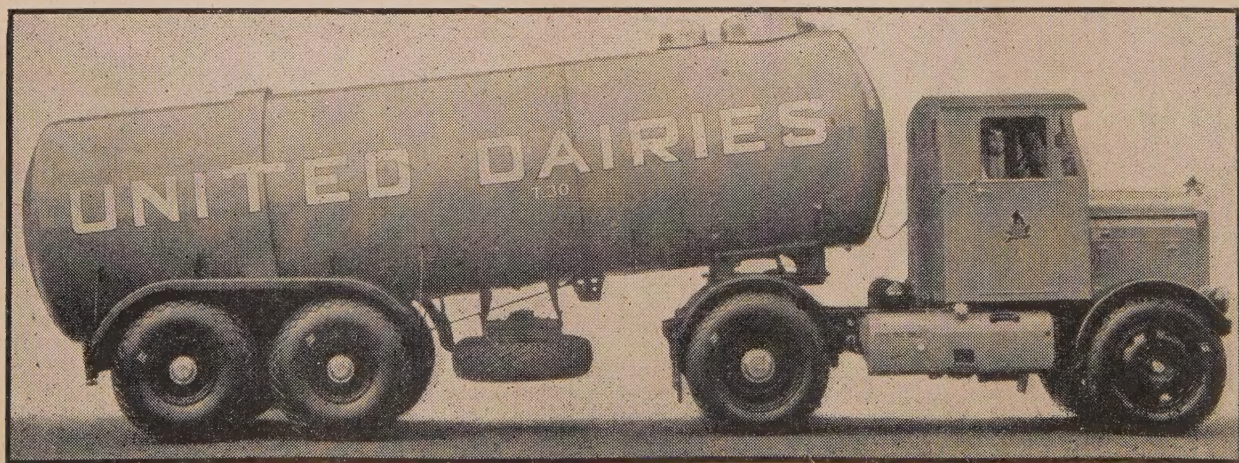
with an appropriately-coloured pin, each complete route being marked with pins of the same colour. By means of such a map the manager can estimate rapidly where any given truck may be at any given time, and in case of breakdown the route of a relief vehicle can be pin-pointed without difficulty.

Ideally, milk should be cooled by mechanical refrigeration on the farm, and where this is the practice little deterioration can take place during the transit of the milk from the farm to the depot. Where it is not done efforts should be made to keep the milk as cool as possible during its journey to the depot. New Zealand practice leaves much to be desired in

this respect, as unshaded or open trucks are the almost universal means of milk haulage. To bring New Zealand methods up to the best overseas practice—and in this England is not the leader—trucks of the insulated box van types should be used, and internal cooling should be provided in them either by built-in refrigeration units, by the addition of flaked or block ice, or by the provision of cooling plates. These cooling plates are hollow tanks of narrow cross-section filled with a special liquid. The plates are placed for a few hours in the depot cool stores until the liquid inside has frozen solid; the plates are then hung in the truck and while the liquid inside is melting again the plates are absorbing heat, just as a block of ice does when it is melting, and thus keeping the milk cool.

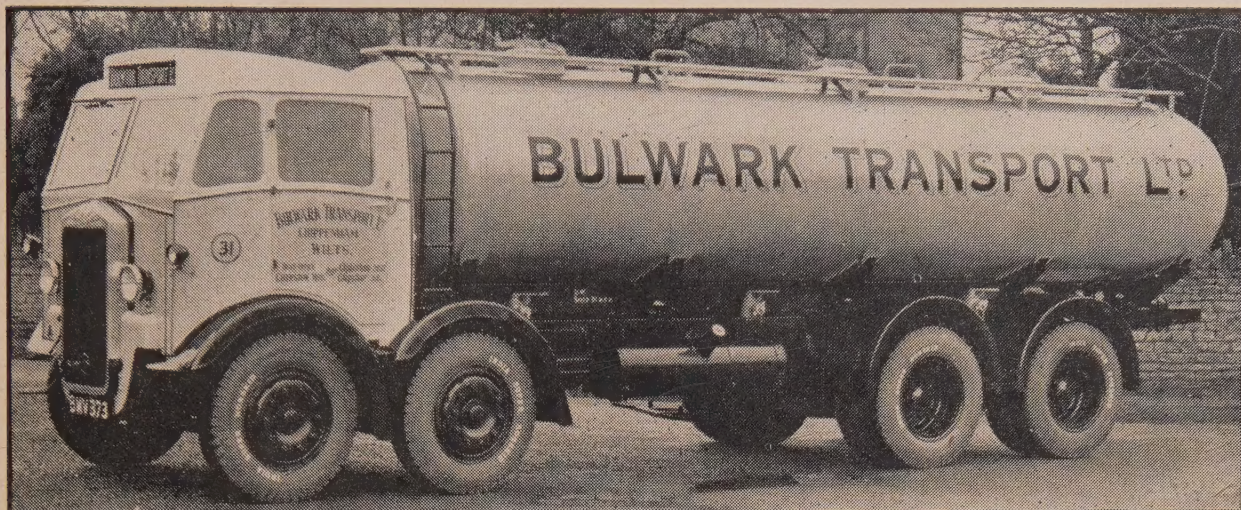
As the keeping quality of milk is assessed from the time it is processed and bottled, it is usual to treat the milk as near the place of ultimate consumption as possible. Where the processing depot is not too large—for example, where it handles say 10,000 gallons a day—it is usually practicable for the milk to be brought straight into the depot direct from the farm on the hauler's truck. Where the depot is a large one of a capacity of over 20,000 and even up to 100,000 gallons a day, this arrangement is not always practicable; then the milk is delivered to country depots, or bulking stations, where it is first sampled, tested, weighed, cooled, and bulked for rapid dispatch by road or rail tanker to the town depot.

This latter arrangement is the one most commonly used in large cities, as apart from the difficulties of getting milk-collection trucks into the depot in large numbers and uniformly on time, due to the density of urban traffic, the area where the milk is available does not always lie close to such cities. To illustrate this point it could be mentioned that London



A single-compartment 3000 gallon road tank mounted as a semi-articulated unit. In this type of construction the tank forms part of the chassis.

MARKET MILK TRANSPORT TANKERS



A 3100 gallon three-compartment milk tanker mounted on a 12-wheeled rigid chassis.

draws some of its milk from farms 300 miles away, Oslo from 200 miles away, and New York from farms up to 400 miles distant.

Bulk Transport Facilities

To transport milk over such distances requires the use of bulk transport facilities, and these are provided by road tankers, rail tankers, and vehicles known as road-railers.

Road tankers are similar to the big petrol tankers used on the roads of New Zealand and for milk are usually made of stainless steel or aluminium. They are nearly always insulated with cork, glass wool, coiled aluminium strips, or other suitable insulating material, and a cross-section of such a tanker shows that it is actually two tanks, one inside the other, with the gap of 2in. or so between the two shells filled with this insulating material. The inner tank is called the tank body, and as it is the one with which the milk comes in contact, it is made of stainless steel or aluminium. The thickness of the metal varies from 10- or 12-gauge aluminium to 14- or 16-gauge stainless steel. The inside surface is perfectly smooth and polished to a mirror finish. The outside tank is called the sheathing, and as it is there only to protect the insulation and to offer a suitable surface for a decorative or streamlined finish, it is usually fabricated of thin steel or sheet aluminium.

These tankers are built in sizes of 800 gallons to 3000 gallons capacity and can be mounted either on a single rigid chassis or on an articulated chassis. On slippery roads many operators prefer the rigid chassis, as with a partly-loaded tanker there is a dangerous surge of liquid when the tanker has to brake suddenly; the writer has

seen sudden braking and the resultant surge of milk cause an articulated tanker to slip right off the road into a ditch, pulling the cab after it. To obviate this surging danger the tank is sometimes mounted at a slant on the chassis. (A photograph of such a tanker is reproduced on the opposite page.) Usually the largest-capacity tankers are mounted on a chassis with four axles and 12 road wheels, and the gross laden weight is then about 27 tons.

New Prices for Dairy Produce

PRICES for dairy produce for the 1947-48 export year are 205s. (sterling) a cwt. f.o.b. for butter and 118s. (sterling) a cwt. f.o.b. for cheese. This was announced by Mr. W. Marshall, chairman of the Dairy Products Marketing Commission, who stated that agreement had been reached with the United Kingdom Ministry of Food for the sale at these prices.

Rail tankers usually look more functional than the modern streamlined road tanker. As weight is not such a critical factor, they can be made of heavier metals, which is just as well, as they have to be robust to stand up to the banging about they may get in shunting yards. The two metals usually used in the construction of these tanks are stainless steel and glass-lined mild steel, the latter being a mild steel on to the inside of which a thin layer of hard glass has been permanently fused. Rail tankers are built in sizes of up to 3000 gallons capacity in England and 6000 gallons in America, and

are made in both insulated and uninsulated patterns. The uninsulated ones, however, are often fitted with a top cowl mounted an inch or two off the upper half of the tank; during the train journey air sweeping between the cowl and the body of the tank tends to keep the tank cool both by the velocity of the air and by the protection afforded to the top of the tank from the direct rays of the sun.

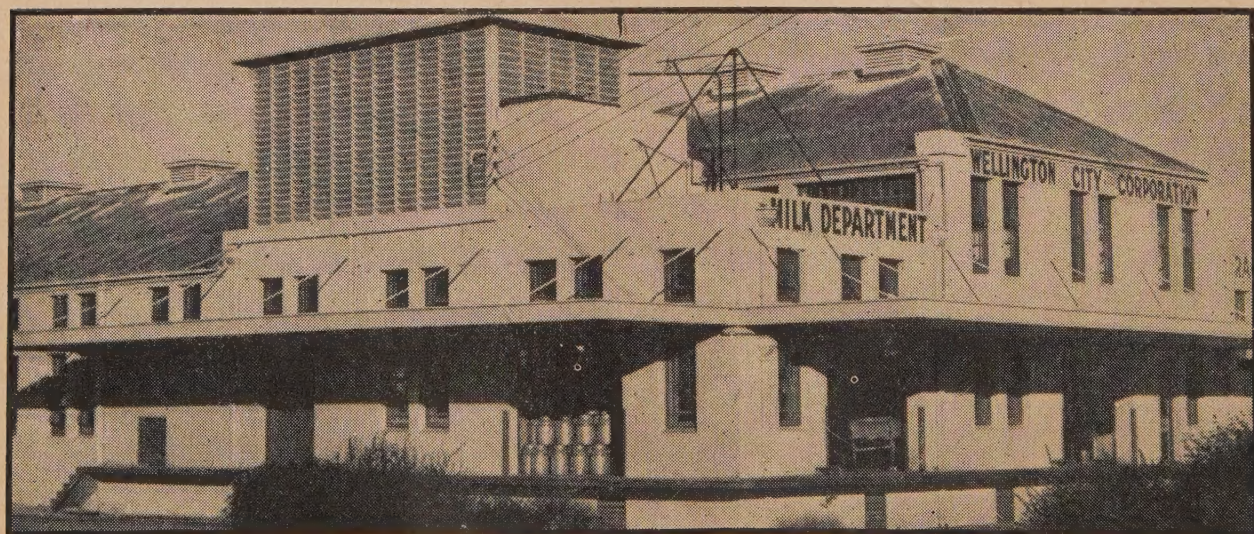
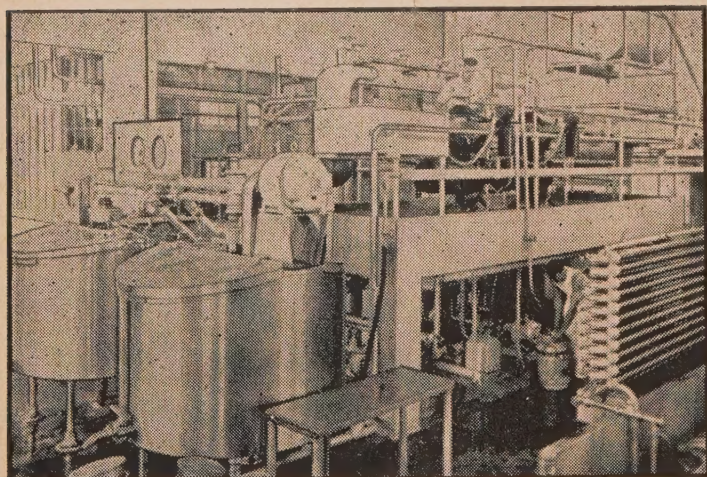
Road-railers, as their name implies, are a hybrid product and are in effect articulated road tankers which are hauled by the tractor unit on to a flat railway wagon. After the tanker part is chained down securely it is conveyed as an ordinary wagon load to the receiving end of the journey, where another tractor unit pulls it off the wagon and hauls it away to the depot. This type of tanker is suitable where long haulage is necessary and where the dispatching country depot or the receiving town depot is not on a railway siding. Road-railers are not usually as big as the large road tankers, as the allowable height when loaded on the wagon must include the height of the road wheels under the tanker body.

All three types of tanker are equipped for emptying either by gravity or by compressed air. Gravity emptying is self-explanatory, but compressed-air emptying may not be so well known to readers. In this system the lid on top of the tanker is left closed and a compressed air line is attached to a special sanitary fitting which is also mounted on the top. The outlet valve is then opened and the compressed air—filtered, of course—is turned on and pushes the milk out of the tank; this method of emptying takes only a few minutes for a 3000-gallon load. If a tanker is emptied by gravity without the lid being opened



MILK DEPOTS AND TREATING HOUSES

Country depots and town depots, or milk-treating houses, handle supplies for the market milk industry. The modern country milk depot of the Wellington City Corporation at Otaki is shown in the bottom illustration and on the left an inside view of the same depot, showing the batch pasteurisers on the left and the cream separator floor above. One of New Zealand's early milk-treating houses is shown in the top illustration.





[Elmar Studios photo.
Mechanical milk cooler with a capacity of 1000 gallons an hour, for factory use. The cooler as shown complete with automatic temperature-controlling equipment is about 15ft. high. The milk section is shown at bottom right.

city like Auckland to dispense with the need for a permanent country bulking depot. Wellington, of course, is more an example of overseas practice, as the Municipal Milk Department gets part of its supplies from its country balancing station at Otaki about 50 miles north of the city.

However, as the various plant operations in country depots are identical with those in a town depot, there is no need to detail them except to explain that the main function of the country depot is to bulk and cool the milk to below 40 degrees F. to retard bacterial growth and then to ship it without delay to the town depot for complete processing, bottling, and dispatch to the dairyman or vendor.

Town Depots

Town depots are called milk-treating houses in New Zealand. This is an accurate description, though in the writer's opinion "house" is hardly synonymous with the building surrounding a modern milk-treating plant; some of these places overseas are very large and handle up to and over 100,000 gallons of milk a day. In New Zealand they do little except process milk and cream, but in Continental depots and in practically all American depots a wide range of dairy products is handled, including various grades of cream, homogenised milk, irradiated milk, pasteurised buttermilk, cultured milk, cottage cheese, ice cream, etc. However, before dealing with these interesting avenues of milk processing consideration should be given to what takes place in a typical large milk-treating house in New Zealand.

It must first be emphasised that "treating" or "processing" is not synonymous with "pasteurisation." In a milk-treating house milk is treated either by chilling only (when it is popularly called "raw" milk) or by pasteurisation (when it is called in accordance with the law "pasteurised" milk). It is a common fallacy that just because milk comes from a big town depot it can therefore only be pasteurised milk.

When the milk arrives it is sampled, weighed, bulked, and pumped through coolers into big storage tanks, from which it is drawn off as required for processing either as "pasteurised" or as "raw" milk. The weighing machine is usually of the dial indicating type and can weigh up to 1000lb. of milk at a time; from the stainless steel pan of the weighing machine the milk is directed into small tanks of about 200 gallons capacity called "dump tanks" and is pumped from there by a centrifugal pump through or over a refrigerated cooler into the large storage tanks, the capacity of which can be up to 7000 gallons or more, though 3000 gallons is the more usual maximum in this country. The cans after being emptied are washed in a can-washing machine capable of handling 500 cans or more an hour.

Can Washing

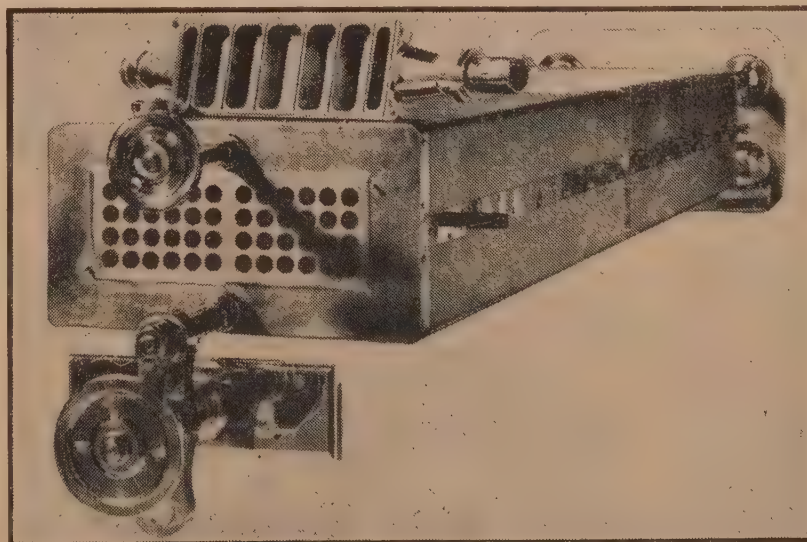
Can washing is one of the most important processes in a modern milk plant; a dirty can is a potent source of contamination. A milk can is not unduly difficult to sterilise, but though

first to permit air to enter as the milk leaves, there is danger that the tank will collapse from the semi-vacuum inside and the pressure of the atmosphere outside. To guard against this a safety valve is usually fitted on the tank to admit air automatically.

Country Depots

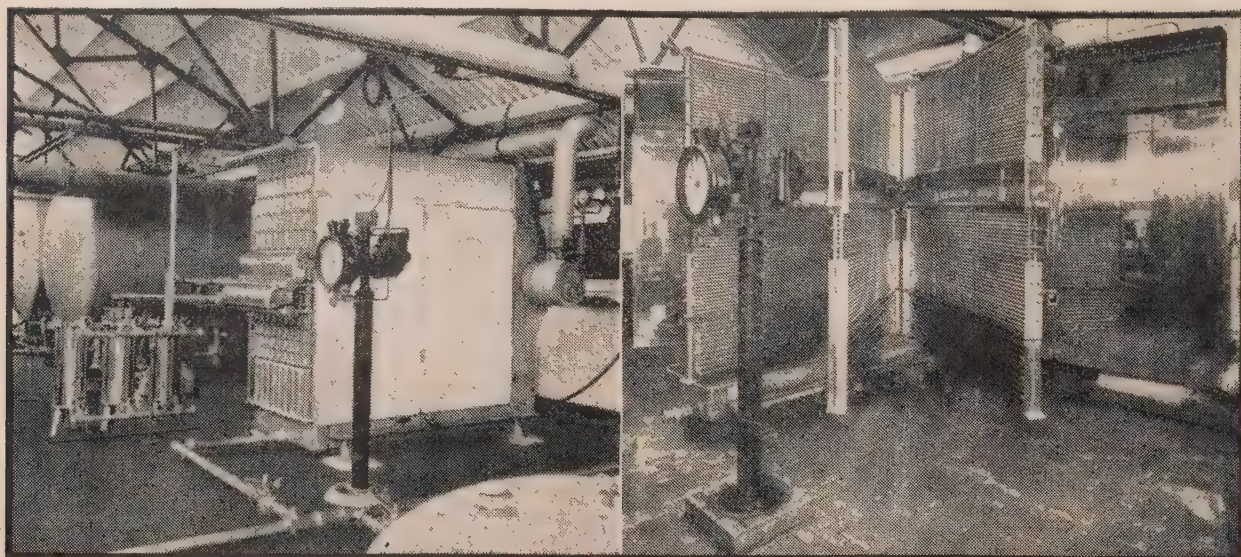
Country depots are desirable if long hauls are necessary to deliver the milk into large urban areas. If all their milk will always be needed by the town depot, they are equipped only to receive, cool, bulk, and dispatch milk, but if the town depot uses them to balance on—that is to buy from them just what they need to balance their daily demand—they have to be equipped to manufacture their surplus milk.

This is less a problem in New Zealand than it is overseas, as towns here are so much smaller, and there is enough potential market milk produced within a close radius of a large



[Elmar Studios photo.
The construction of the milk section of the raw milk cooler illustrated at top left, looking down on the vertical stainless steel tubes through which the milk flows.

PASTEURISING MARKET MILK



Left—A 2000 gallon per hour gravity type pasteuriser. Storage tanks are in the background and automatic temperature controller in the foreground, with a 3-unit milk filter to the left of the pasteuriser. Right—The same type of pasteuriser opened for cleaning. On either side are the hinged stainless steel covers used to prevent dirt getting on to the machine while in use. In operation the milk flows down over the corrugations and the heating and cooling substances inside the corrugations.

the washing machines of today are normally efficient, they cannot always do a perfect job on exceptionally-dirty cans where stale milk has caked on hard, on cans in which a hard, hot-milk scale (called "milk stone") has gradually built itself up, or on chipped, buckled, or rusty cans; with the exception of the last mentioned, which should be repaired before re-use, such cans can be sterilised properly by a machine only if they have been thoroughly scrubbed first by hand.

In the can-washing machine each can is subjected to a vigorous jetting by sprays of (1) rinse water, (2) boiling hot soda water, (3) clean boiling hot water, (4) steam, and (5) a hot-air blast which dries it off completely. The machine is a series of tanks and pumps and jets with an automatic carrier device to place each can in proper sequence centrally over the appropriate jets. Several makes of machine are designed to deliver the can after sterilising with the lid replaced correctly in position.

Milk cans are usually made of tinned steel and nowadays are completely seamless. Though round cans are universal in this country, square cans are popular in several countries in Europe where the 40-litre can is widely used; in size this can approximates to New Zealand's 10-gallon unit. Aluminium and aluminium alloys used in place of tinned steel by some manufacturers overseas make a smart can which stands up very well to hard wear, their attraction of course being their lightness. Care has to be taken to see

that soda solutions are not used for washing aluminium cans, as these would gradually eat them away; fortunately there are other good washing agents which exert no action on aluminium.

Processing—Raw Milk

The processing of milk for subsequent bottling and resale as "raw" milk is comparatively simple, as all that is done is to chill it to a temperature of 40 degrees F. or slightly under. This chilling retards the growth of sour

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milk-forming bacteria and thus helps the milk to retain its keeping quality until it has been consumed.

Chilling does not kill bacteria and cannot therefore have any lethal effect on disease germs which may be in the raw milk; in this respect raw milk differs from pasteurised milk, in which all disease germs have been killed.

The chilling is carried out either on open coolers or on totally-enclosed tubular coolers. The difference between the two methods lies in the fact that on the open cooler the milk flows over the exterior of a set of tubes through the interior of which the refrigerant—that is, the cooling agent—flows, whereas in the enclosed type of cooler the milk runs inside the tubes while the refrigerant surrounds the outside of the tubes. Plate coolers in

which chilled water is used as the cooling medium are also popular; in these machines the milk flows up and down a series of rectangular plates on the other side of which chilled water flows. These plates are held tightly together in a suitably-designed frame, the space between the plates permitting the milk on one side and the water on the other side to flow only in quite thin films.

Processing—Pasteurised Milk

Pasteurisation in this country appears to have been the target of much well-intentioned but misinformed criticism. There is nothing to justify much of this criticism and it is hard to understand the antipathy of many people to pasteurised milk, though many parts of America went through the same phase some 40 years ago and England and parts of Europe some 20 to 30 years ago.

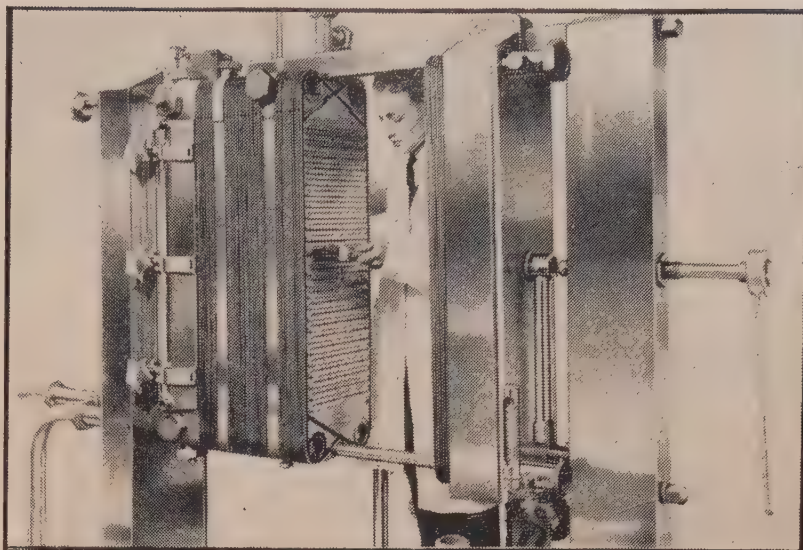
Pasteurisation is a process by which milk is heated to a temperature which varies between 140 degrees F. and 165 degrees F. for a specific length of time and is then cooled rapidly to a temperature of 40 degrees F. or lower. Its function is to destroy all disease germs (pathogenic bacteria) which may be in the milk and thus render it perfectly safe for drinking. The most heat-resistant disease germ which can live in milk is the one which causes tuberculosis. This germ can be killed in milk by heating it to 140 degrees F. for 20 minutes or to higher temperatures for shorter times, so it is obvious that

PROCESSING OF MARKET MILK

the factors of both time and temperature must be taken into consideration. However, as very high temperatures—say, above 165 degrees F.—have a physical effect on the milk, present-day pasteurising machines work at temperatures between the limits mentioned. Thorough investigations in all parts of the world have more than confirmed the fact that at these temperatures neither the physical nor the nutritive properties of the milk are affected.

Pasteurisation is so called after Louis Pasteur, a French chemist who discovered in 1857 that the souring of milk could be delayed by heating it to relatively low temperatures. At the time of his discovery little thought was given to its potentialities, and with the exception of the interest shown by one or two members of the medical profession the process was not developed until some 30 years later. Even then the word "pasteurised" referred specifically to milk for infant feeding which had been heated in bottles to such a temperature as to destroy germs. In 1893 several thousand bottles of this type of milk were distributed commercially for infant feeding in New York.

Between 1880 and 1895 engineers, doctors, and bacteriologists began to give the matter more serious consideration, and during this time the true usefulness of pasteurisation began to be realised. Early efforts at making



The machine shown at bottom left open for inspection. In this type of machine the milk flows in a thin film on one side of each plate and the heating and cooling liquids on the other side. Temperature control gear is not shown in the illustration.

a pasteurising plant resulted in the patenting of a "continually-working apparatus for the heating of milk for the purpose of preservation" in Berlin in 1881. In this machine the milk was heated continuously to between 158 degrees and 176 degrees F.; the capacity of the unit was up to 550 gallons per hour. Various new machines and modifications of existing machines followed rapidly, and in 1890 the first batch pasteuriser was constructed.

In 1907 the first continuously-operating holder pasteuriser was installed in a milk-treating house in New York. This plant revolutionised current pasteurisation methods and ultimately became the pattern for future construction, at the same time giving the industry a satisfactory basis for the defining of suitable standards for the whole process. In 1908 the Medical Officer of Health in Chicago put through one of the earliest municipal ordinances requiring the pasteurisation of all milk (other than certified milk) destined for human consumption within the city.

There is no need to follow the history of the development of Pasteur's discovery in 1857 any further, but people in this country should realise that pasteurisation is not something new and therefore to be viewed with scepticism, but something tried and tested commercially and medically over a period of some 60 years.

Even the municipalisation of milk treatment, which is today's policy in New Zealand, was thought of as long ago as 1893 and urged at a meeting

of the New York Academy of Medicine in 1906, when one of the first vendors of pasteurised milk in New York said, "In 1893 I believed that pasteurisation of milk was the remedy. Today I know it, but all that has been accomplished is only a fraction of the good that could be done were the supply of pure milk a municipal function."

In New Zealand pasteurisation is effected in plants operating either:

1. As holder units, wherein the milk is heated to 145 degrees F. and held at that temperature for 30 minutes, or
2. As H.T.S.T. units, wherein the milk is heated to 162.5 degrees F. and held at that temperature for 15 seconds.

In small depots the holder method is popular and for this purpose a batch pasteuriser is generally used. This machine, as its name implies, is not continuous in its operation, but pasteurises the milk in batches which may vary from 50 to 500 gallons,

In large depots the holder method is also used, but to an ever-decreasing extent, and practically all new pasteurising plants being installed in such depots all over the world are of the H.T.S.T. type. H.T.S.T. stands for high temperature short time and the process is so designated because a rather higher pasteurising temperature—162.5 degrees F. as against 145 degrees F.—is used, but for a shorter time—15 seconds against 30 minutes. The H.T.S.T. process is continuous, even in small plants, and machines are in use which can pasteurise 2000 gallons of milk an hour continuously.



A modern plate type pasteuriser of a capacity of 2000 gallons an hour.

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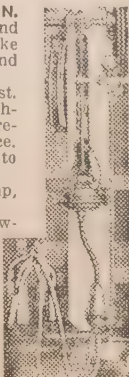
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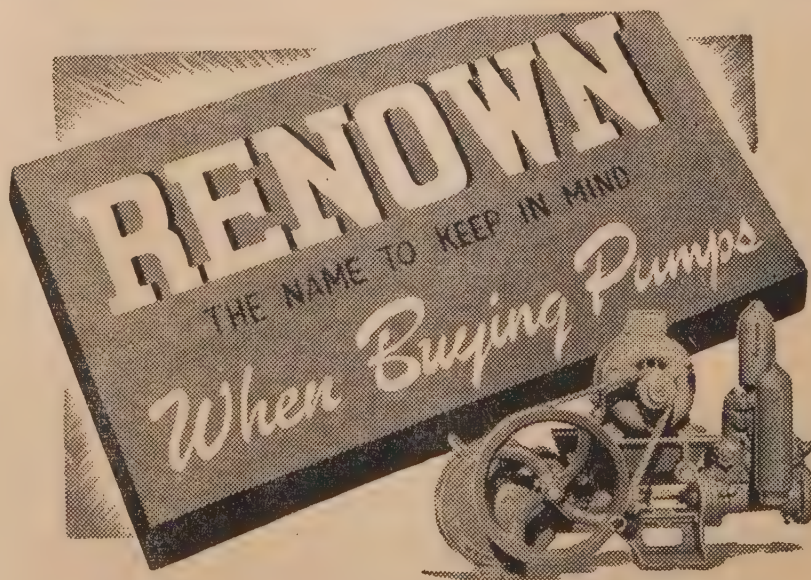
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Today's H.T.S.T. pasteurising plants in use in this country are either of the plate type or of the external flow type. Photographs of both types from which the general outline of their structure can be seen are reproduced in this article. In the plate type the milk flows on alternate sides of horizontally-corrugated rectangular stainless steel plates held close together by pressure in a suitable frame. On the other side of the plates flow the heating and cooling mediums—usually hot water and mechanically-chilled water respectively—except in the middle section of the machine, where the incoming cold milk flows on one side of the plates while the hot milk travelling to the cooling section flows on the reverse side, and an exchange of heat takes place, the cold milk being pre-heated by the hot milk and the hot milk thus being partially pre-cooled. This is a useful provision from the point of view of economy and gives rise to the popular term heat exchanger for this type of plate machine.

The external-flow type of H.T.S.T. pasteuriser consists of a series of horizontal stainless steel tubes mounted one above the other and extending perhaps to 60 in all. The milk flows down over the outside of the tubes and is heated in the top set, through which hot water flows, and cooled in the lower sets, through which flows a suitable chilling agent. Here again the milk is regeneratively cooled in its passage between the heating tubes and the cooling tubes, and in this type of machine it is done by directing the incoming cold milk through the inside of the middle section of tubes while the hot milk flows down outside over them.

In both types of machine the temperatures are automatically controlled so that the milk is heated to exactly 162.5 degrees F. This is achieved by regulating the amount of steam used for heating the water which in turn heats the milk.

The holding time of 15 seconds, which is obligatory in this country, is controlled by making the milk at 162.5 degrees F. (which is the pasteurising temperature) flow through an accurately-dimensioned tube, plate, or trough through which it is known the milk takes exactly 15 seconds to flow. The milk then flows over a highly-sensitive thermometer bulb which permits the milk—as long as the temperature does not drop below 162.5 degrees F.—to continue its journey through the machine, where it is then cooled down rapidly to 40 degrees F., only 8 degrees above freezing point. If for any reason the temperature of the milk flowing over the bulb falls below 162.5 degrees F., the thermometer automatically closes the outlet from the holding tube or trough so that the milk cannot flow on through the machine, and at the same time it opens a valve or tap which directs the milk away

from the machine and back to the tank holding the raw milk. Immediately this valve opens and the milk begins to be diverted away from the machine a loud bell rings and a warning light flashes red so that the plant operator knows the temperature has dropped and is able to stop the machine, trace the source of the trouble, and take the necessary steps to rectify it. When he has done this and restarted operations the machine will continue to divert milk for a few seconds before it returns to normal working—a safety feature which makes assurance doubly sure.

This diversion of any milk which has not been properly pasteurised is foolproof and automatic and is the guarantee that pasteurised milk is safe milk.

There are other types of machines designed for the effective heat treatment of milk, and though they are

... PROCESSING OF MARKET MILK

thin film, is heated by hot water surrounding the tubes. The time taken for the milk to travel through the machine is just under 1½ seconds, and this very short holding time (1½ seconds as against 15 seconds) offsets the higher temperature (164 degrees F. against 162.5 degrees F.).

In America various systems of electrical pasteurisation have been developed with such success that official sanction was given to at least one of the methods as early as 1927. The basis of all these systems is that instead of the milk being heated by hot water through an intervening metal surface, it is heated directly by an alternating electric current passing through the milk itself. The same protective devices operate as with other systems to prevent underheated milk contaminating the properly-pasteurised milk.

In-bottle Pasteurisation

Before leaving this section on pasteurisation a few words on a system considered ideal in many respects may be of interest. Many authorities have felt that the inherent weakness in most systems of pasteurisation is the danger of contamination of the milk after pasteurisation and before it has been delivered to the customer. This danger is remote, of course, where properly-designed storage tanks and adequate and hygienic automatic bottling and capping machines are in use. However, where such a danger might exist the obvious cure is to avoid the milk being handled at all after pasteurisation, and this can be done by pasteurising the milk in the bottles after they have been filled and sealed.

Such a system of pasteurisation has been developed in England and is in practical use in several town milk depots there. The latest type of "in-bottle pasteuriser," as it is called, requires the milk to be heated to 146 degrees F. and filled into pre-warmed sterile bottles which are then sealed. The bottles, after sealing, are placed in crates and the crates placed on a continuous slow-moving conveyer which carries them through a specially-constructed hot chamber where the air is kept mechanically heated at a temperature of 147 degrees F. As it takes the bottles exactly 30 minutes to traverse the chamber, the system is still the holder method already mentioned. After leaving the chamber the bottles in the crates continue their journey through a trough of cooling water which covers the bottles up to just below the rim. The temperature of the milk is gradually reduced in this manner until it reaches 40 degrees F., when the crated bottles are then ready for cool storage or dispatch. This cooling period usually occupies about half an hour.



The above is a reproduction of a poster issued by the Aid for Britain National Council.

quite efficient, not many of them have attained popularity in either England or New Zealand. In Denmark the process of "Stassanisation" is deservedly popular. In this method of heat treatment milk is heated to a temperature of about 164 degrees F. in a series of concentric circular tubes. The tubes, made of stainless steel, are in sets of two, so arranged that the space between the outside surface of the inside tube and the inside surface of the outside tube is very small—about three-fifths to four-fifths of a millimetre (which is about thirty-thousandths of an inch)—and the milk, flowing through this space under pressure in a very

PROCESSING OF MARKET MILK . . .

Although this system appears to be a near approach to an ideal, it has not attained any world-wide popularity. One possible reason may be that pasteurisation is not confined to the milk but is also applied to the bottles and crates, the heating of which requires unnecessary expenditure on fuel. A second reason may be that although the plant itself is usually bulky and expensive, a second pasteurising unit of some other description is still required to handle milk which is to be sold in cans to restaurants, hotels, and similar establishments.

Filtration

Parallel with the process of pasteurisation is carried on the process of filtration. Milk received from a number of farms and bulked at the town depot usually contains a certain amount of suspended dust. The milk is normally strained by the farmer at the time of production, and it is again strained through a fine-mesh metal strainer on arrival at the depot. However, neither of these strainings is adequate to remove suspended matter from the milk, which has to be done under pressure through a very close-textured filter cloth after the milk has been raised above blood heat. Alternatively it may be done by means of a clarifier, which is in effect a separator so designed that instead of separating the fat from the milk it separates out only the suspended matter.

Many people are familiar with the layer of slime which adheres to the separator bowl after separating is finished. If milk for drinking is not filtered or clarified, all this slime, together with the dust and dirt which are mixed in with it, stays in the milk, and apart altogether from the hygienic aspect, the aesthetic appeal of such milk is completely destroyed for the fastidious consumer.

Present-day pressure filtration methods are highly efficient and

Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in February as under:—

Auckland—1YA, on February 24, at 12.35 p.m., "Answers to Questions," by H. Preston, Supervisor, Northland District Pig Council.

Palmerston North—2ZA, on February 20, at 7 p.m., "Factors which Influence Profits from Pigs," by L. L. Marsdon, Supervisor, Wellington District Pig Council.

Napier—2YH, on February 12, at 7.15 p.m., "Finishing the Second Litter," by H. Hopkins, Supervisor, Tairāwhiti District Pig Council.

remove every objectionable particle from pasteurised milk.

The pressure filtration of raw milk presents various difficulties, as to be efficient the milk needs to be pre-heated at least to blood temperature before being put through the filter or clarifier. The fat in cold milk is naturally in a more viscous state than it is in hot milk, and this fact alone gives rise to one of the major difficulties encountered in cleaning raw milk. This problem of the efficient filtration of raw milk is not one which has yet been generally overcome in New Zealand.

Milk Storage

From the chiller or the pasteuriser the milk flows into storage tanks similar to the tanks already mentioned. As these are usually insulated, the temperature of the milk does not rise, and milk may be held in them for several hours without any degree of deterioration taking place.

To avoid the difficulties which might arise due to the cream settling to the top of the milk, special agitators are fitted to the tanks to keep the milk moving continually. There are various types of agitators, the most popular being a two-, three-, or four-bladed propeller which revolves fairly slowly—about 100 to 200 revolutions a minute is customary—and keeps the milk in a continual state of movement, rather like the way a ship's propeller keeps the water under the stern of the ship continually turbulent.

An alternative method of agitation provided by compressed air is popular with many plant operators where large numbers of tanks are in use. The air, after filtration, is bubbled into the milk through a stainless tube which extends to the bottom of the milk in the tank, and in its journey to the surface of the milk the air keeps it in a satisfactory state of agitation. From these storage tanks the milk is directed—usually by gravity—to the bottle-filling machines.

(To be continued in the April issue.)

A Taranaki Gate That Swings

By G. A. BLAKE, *Instructor in Agriculture, Matamata.*

BECAUSE of timber, ironwork, and labour shortages the use of the Taranaki gate is increasing, but the difficulty in opening and closing it remains. The gate can be converted into a swinging type that is stockproof, yet easily handled, with the addition of one piece of 4in. by 2in. scantling and a light hinge.

THE gate is made in the ordinary way, but the top barbed wire is doubled as the rigidity of the gate depends greatly on this wire. One end of the piece of 4in. by 2in. timber is bolted to the bottom of the batten at the hinge end of the gate and the other end bolted (with one bolt) to the batten at the other end of the gate at a point slightly above the middle of the batten.

The gate is hung by using a light hinge at the bottom and a double strand of plain wire at the top. The intermediate battens may be nailed to the crossmember with one 4in. nail, but this is not essential.

The raised end of the crossmember exerts a pressure toward the ground, but is prevented from falling by the top wire—the reason for doubling the wire. In exerting this thrust the crossmember tightens all wires simultaneously by tending to force the end batten nearer to the post.

Should the gate sag unduly at any time it can be brought back to the desired position by tightening the top double barbed wire (by inserting a stick between the strands and twisting it) and by shortening the second wire.

When swung between the posts this gate may be opened in either direction—a useful feature.

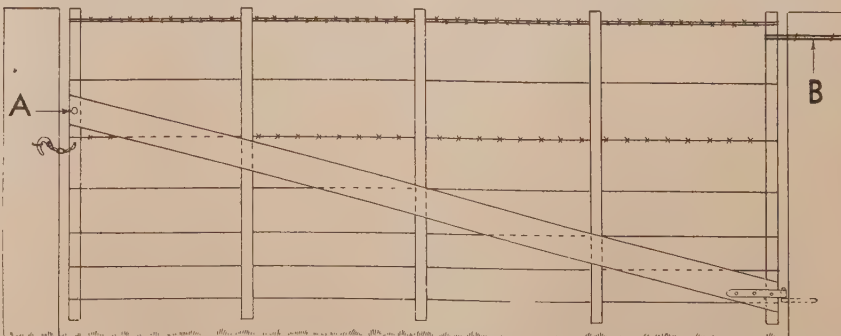


Diagram of the gate. A—The bolt holding the crossmember. B—The double loop of plain wire.

Making the Best Use of the Breeding Sow



By A. LONGWILL, Assistant Superintendent of the Pig Industry, Wellington.

THE number of sows in New Zealand at January 31, 1947, was fewer than 68,000—the lowest figure since 1931. If enough pigs are to be raised to consume the dairy by-products in the flush next season, pig keepers must take steps immediately to

1. Secure a well-bred gilt from a breeder or save a promising gilt from the baconer pen and have her mated for winter or spring farrowing;

2. Make sure that the management of all breeding stock is such that they can give of their best—more pigs to the sow.

IN view of the prices paid for weaner and store pigs this season there is no doubt that those steps will pay. Since 1941, when the highest mark recorded in this country was reached—10.7 pigs slaughtered per sow—the figure has fallen back and last year was only nine pigs slaughtered per sow. The result of the shortage of pigs is seen in the waste of dairy by-products in the flush of the season and the production of too many overweight pigs. Without doubt a greater number of pigs finished in the desirable weight ranges, 140 to 160lb. for baconers and 70 to 90lb. for porkers, would be the better policy for the maintenance of both the quantity and the quality of production.

Knowledge of Reproduction

From work done both in this country and overseas it is known that:

1. A considerable proportion of sows fail to get in pig immediately after weaning a litter.
2. Where conception takes place about one-third of the eggs shed do not give rise to a full-term offspring. The causes of that failure of some eggs to be fertilised or, if fertilised, to complete foetal development are obscure, but the condition and fertility of the boar at the time of service and the nutrition of the in-pig sow probably play a considerable part.
3. Nearly 5 per cent. of all pigs born are born dead.

4. A further 25 per cent. die before being weaned, most of them in the first two or three days.
5. In general the more pigs born in a litter the more are weaned, at least up to 10 pigs a litter.
6. In large litters the average birth weight tends to be lower, and small, poorly-developed pigs are more likely to be born dead, to perish early, or to be slow growers if they survive.

Sow Management the Key

Sows which are fed so that they do not become too poor at weaning time, and so that they are in rapidly-improving condition when they take the boar and for a few weeks thereafter, are more likely to breed regularly than are those which are allowed to become too poor or are merely turned out on grass without any extra feeding after weaning a litter. One of the causes of the low number of pigs reared per sow in this country—failure to get two litters from each sow in 12 months—can be overcome if more attention is paid to those facts.

Feeding during the last month of pregnancy is most important to ensure well-developed pigs at birth. The ration should be rich in protein to nourish the rapidly-developing litter and sufficient to enable the sow to improve in condition without becoming overfat. Properly applied, those general principles of feeding the pregnant sow should result in fewer still births, stronger pigs which are less likely to perish in the first day or two of life, and rapidly-growing youngsters.

Losses at and shortly after farrowing to a large extent depend on the temperament of the sow, and selection of breeding stock for mothering qualities will always be of great importance. Try to be on hand when the sow is farrowing and watch particularly the young sows' care in moving among their piglets. Do not persevere with a clumsy sow.

See that the boar is kept in good working condition, without sudden variations caused by alternating periods of starvation and overfeeding. If the boar is kept in a pen by himself, each sow should be served on the second and third day of heat. If there are no other sows to be mated to the same boar for some time, a service on the first day also may be worth while. The fertility of a boar run with dry sows is not likely to be seriously affected if the farrowings are properly spread over a period.

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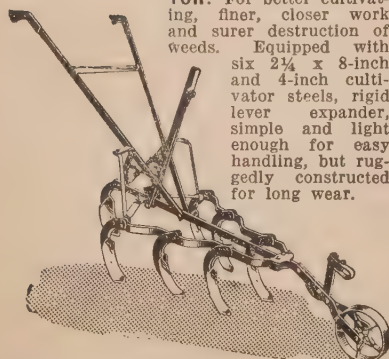
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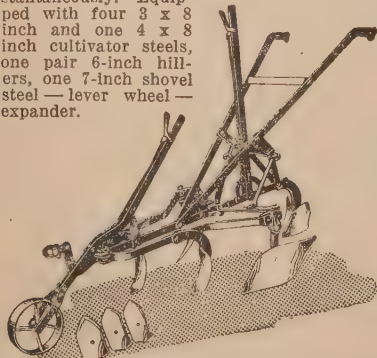
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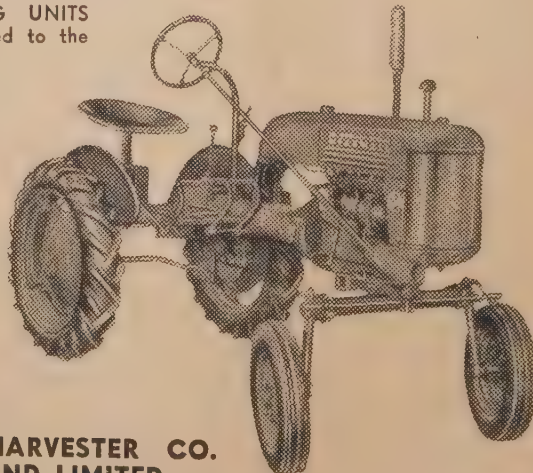
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THE HOME GARDEN IN FEBRUARY

By A. G. KENNELLY, *Instructor in Vegetable Culture, Christchurch.*

THOUGH the harvesting of peas, dwarf and runner beans, salad vegetables, a variety of root crops, onions, cucurbits, and other vegetables provides a welcome reward for earlier effort, there are other important jobs to be done in the home garden in February. Beetroot, silver beet, spinach, radish, turnip, lettuce, and spring cabbage can be sown, and if a rich, well-cultivated soil is available, sturdy plants of celery and of brassicas such as savoy cabbage and broccoli can be set out early in the month.

THE hoe should be kept going both to destroy weeds and to break up any soil crust that forms. Wherever possible a surface mulch of grass clippings should be spread on the ground to prevent the roots from drying out. Asparagus and other crops should be kept weeded; beans, peas, and cucumbers should be harvested regularly to prevent decline in vigour of the vines due to seed maturity. Crops such as beetroot, parsnips, lettuce, turnips, and swedes should be thinned. Insect pests and diseases are likely to be troublesome and preventive sprays or dusts should be applied to brassicas and in northern and central districts to tomato and potato crops. Seed heads should be removed from rhubarb and the crowns tidied. A sowing of parsley can be made to provide supplies through the winter and spring. Germination is usually slow. Most growing crops will benefit from the regular application of liquid manure.

Artichokes (Globe)

The scales of the huge immature flower buds are the edible portion of the globe artichoke, and though the taste is an acquired one, they are highly prized by connoisseurs. A plentiful supply of water is essential for development and the heads should be kept cut and used as they develop; if cut with a few inches of stem another flower usually develops lower down. Apart from watering and weeding and the removal of decayed foliage at the base, the plants should not require further attention at this time of year.

Celery

In districts where autumn weather favours growth celery can still be set out as advised in last month's "Journal." Where winter weather is

not too boisterous or frosts too severe Golden Self Blanching can be set out. Elsewhere one of the hardier varieties such as Solid White is preferable.

Celery plants should receive plenty of water; organic liquid manure is also especially necessary. It is important to keep the plants growing vigorously and sprayed regularly with Bordeaux mixture or a suitable Government-certified copper fungicide.

Chinese Cabbage

Resembling cos or romaine lettuce and in size and appearance not unlike Swiss chard, the Chinese cabbage or lettuce-cabbage is one of the chief foods of the Chinese peasant. It can be treated as a lettuce, but does best in cool weather. If a spring crop is desired, the seed should be sown three or four weeks before the young plants are to be set out in early spring. Autumn sowing is preferable, for if the weather is hot and dry and the growth consequently slow, the plants will not "head" but develop a seed stalk. Varieties are available which mature in from 70 to 90 days. Chinese cabbage stores quite well after cutting and may be eaten either cooked or raw. The inside blanched leaves and

heavy but tender midrib have a delicate celery-lettuce flavour. It is a vegetable that deserves to be more commonly grown in New Zealand.

Sow $\frac{1}{2}$ in. deep and transplant seedlings when 3 to 4 in. high 12 in. apart in rows 20 in. apart. The soil should be moist, well drained, and very rich in humus. Blood and bone broadcast at $\frac{1}{2}$ lb. a square yard after digging and lightly forked in before planting should give satisfactory results. Weekly applications of liquid animal manure or an early side dressing of nitrate of soda at the rate of 1 oz. per square yard are also recommended on any but the richest of soils. There are three varieties, all of which are good. Wong Bok (Pao Ting) is a short, quick-growing variety 9 to 11 in. high and up to 6 in. in diameter. Pe Tsai, a taller and thinner variety than Wong Bok, with looser leaves, stands dry conditions slightly better, but the flavour is not usually considered as good as that of the others. Chihli is a tall early variety 15 to 20 in. high with a base diameter of 3 $\frac{1}{2}$ in.

Endive

Because of its hardiness endive provides an excellent substitute for



[Green and Hahn Ltd. photo.]

A good home gardener who answered the call for an extra row of potatoes this season. He keeps the hoe going both to destroy weeds and to break up any soil crust that forms during hot summer weather.

THE HOME GARDEN IN FEBRUARY . . .

lettuce. Unlike the lettuce, however, unless it is blanched by tying the leaves of the full-grown plant together at the top before using, it is very bitter. The leaves of young plants may, however, be used for salads or cooked as a substitute for spinach. There are two main types of endive. The broad-leaved Batavian variety is sometimes referred to as escarolle and is particularly hardy. It produces a broad leaf, toothed on the outside and slightly twisted, with thick ribs. It forms a compact heart which blanches to a creamy white and often attains a diameter of 18in.

The leaves of the curled variety are much finer and grow tufty and full in the centre with a broad, white, fleshy midrib which branches readily. Curled varieties grow up to 20in. in diameter. They are a little less hardy than the Batavian varieties but have a more attractive, rather nutty flavour. Except for blanching, cultivation is similar to the lettuce. Blanching takes three to four weeks and with the curled variety is best done by covering the plants when they are dry with a box or pot with the drainage hole covered. Plants quickly begin to deteriorate after blanching is complete, and it is advisable to blanch only a few at a time.

Sow $\frac{1}{2}$ in. deep in well-drained soil rich in humus in rows 15in. apart and later thin or transplant 10 to 12 in. apart in the rows. Blood and bone broadcast at $\frac{1}{2}$ lb. a square yard and lightly forked in after digging and before planting has given good results on soils lacking in humus.

Kohl Rabi or Turnip-rooted Cabbage

The flavour of kohl rabi is considered by many people to be superior to that of most members of the cabbage group. It combines the flavour of both

cabbage and turnip and is grown for the bulbous root which forms above the ground somewhat after the manner of a turnip. To secure tender bulbs it should be grown quickly. If allowed to reach maturity, it becomes tough and stringy, and it should not therefore be allowed to grow beyond $2\frac{1}{2}$ to $3\frac{1}{2}$ in. in diameter. Kohl rabi is hardy and late sowings may be pulled as required until late spring. It does not keep well in store. Though grown largely as a cool-weather vegetable, it can be used as a substitute for turnips during a hot, dry season or where turnips fail due to lightness or dryness of the soil.

Kohl rabi do best in a soil well drained and reasonably rich in humus. A dressing of a mixture of two parts blood and bone and one part superphosphate at the rate of 3 to 4oz. a square yard will be beneficial on most soils. Seedlings may be transplanted, but it is usually preferable at this time of year to sow the seed $\frac{1}{2}$ in. deep in rows 12 to 15in. apart, and later to thin the plants to 6 to 8in. apart in the rows. Roots allowed to become dry will have a bitter flavour.

Onions

The harvesting of main-crop onions is commenced in most districts in February. The keeping quality of onions will depend largely on the care taken in harvesting, though a spell of fine weather for drying off the bulbs is of almost equal importance, unless a suitable drying room is available.

In harvesting onions the roots can be cut by running a sharp hoe carefully along the row about $\frac{1}{2}$ in. under the bulbs. This stops growth and so facilitates drying. The onions should then be pulled and laid on their sides with the roots exposed to the sun. In wet weather it may be necessary

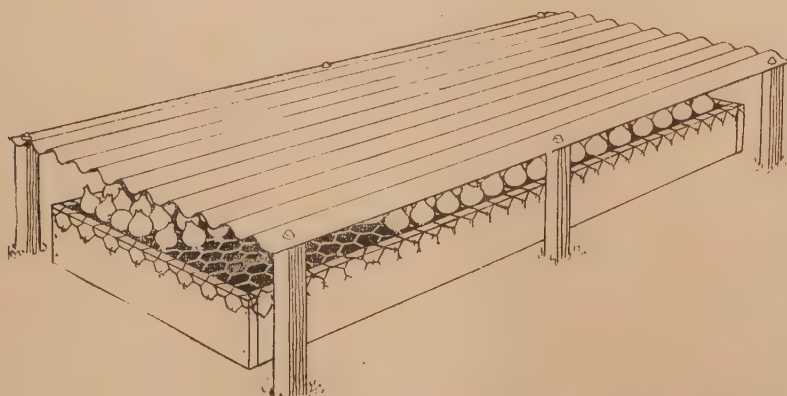
to turn them two or three times. Home gardeners can assist drying of the bulbs by bending the tops over when the onions have reached their maximum growth, about a fortnight before lifting. It is usual to bend the tops of two adjoining rows toward each other. Bulbs with thick necks that refuse to bend should be selected for early use. If the weather alternates between wet and dry, the onions should be lifted off the soil and spread to dry elsewhere. The home-made drying frame illustrated consists of wire netting stretched on four pegs with a sheet of corrugated iron about 3in. above the netting. The onions are placed on the netting; the iron is quickly warmed during sunshine and the warm, dry air circulates about the onions to dry and ripen them.

Apart from diseases such as pythium sclerotinia and fusarium (variously known as bottom rot, root rot, etc.), which are primarily diseases of the field and are usually only of importance in storage when they escape notice in sorting before storage, there are a number of true storage diseases of which the most important is neck rot (*Botrytis allii*). Proper care during harvesting with storage where facilities are available at temperatures held at as near as possible to 32 to 35 degrees F., with relative humidity of 70 to 75 per cent., are the chief measures of control. U.S. Department of Agriculture Bulletin No. 1060, "Onion Diseases and Their Control," states, "Proper care of the crop during harvest and curing are the chief measures of control for neck rot. Avoid exposure to damp weather. White varieties should receive special attention. Proper sanitation (that is, burning of onion refuse and diseased bulbs . . . the spores of certain of these organisms, especially those causing neck rot, are readily carried long distances by wind . . .) is very important and worthy of careful consideration in connection with this disease. Artificial curing of white sorts is advisable when curing weather is unfavourable and neck rot has started to appear. This requires special equipment and is not ordinarily economical for the average grower. . . ."

Potatoes

Potatoes should be dug in an immature condition only when they are going into immediate consumption or if the land is required for another crop. Though it is usually necessary to dig early varieties before the plants have reached maturity, it is advisable where there is sufficient ground to arrange digging so that the main crop is left until quite mature. If potatoes for keeping are dug in an unripe state, there is likely to be heavy loss in storage. The skin should be quite firm; rain and a slight frost or two usually help to firm it so that potatoes handle with less likelihood of bruising.

DRYING ONIONS ON A HOME-MADE FRAME



Sun shining on the corrugated iron circulates warm, dry air about the onions set out on wire netting stretched on four pegs about 3in. below the iron.

[From the British Ministry of Agriculture's "Food for Health and Profit."]



Harvesting of onions begins in most districts in February. Drying of the bulbs is assisted by bending the tops over when maximum growth is reached. The roots may be cut by running a sharp hoe along the row $\frac{1}{2}$ in. under the bulbs. The onions should then be pulled and laid on their sides.

Aucklander Short Top, which is a very popular and extensively-grown variety, requires special care. This variety has a delicate skin and soft flesh and is very susceptible to damage. If the damage were confined to injuries caused by mechanical operations, it would perhaps not be very serious, but unfortunately damage which occurs in digging often turns quickly to dry rot. This disease (*Fusarium* spp.) is a wound parasite and infection takes place, through an injury, from spores that are present in the soil and which may adhere to the hands or implements used in handling potatoes. Often the disease spreads inward at a greater rate than it does to the outside tissues and a small, scarcely-discernible abrasion may overlie a large, decayed, inner cavity.

In districts where the potato tuber moth is troublesome it is not advisable to leave the tubers uncovered after digging. They should be bagged and the bags closed securely and up-ended at once.

Silver Beet, Spinach, Spinach Beet

Though they differ a little in habit, silver beet, spinach, and spinach beet are similar in their culinary uses. Silver beet does not mature quite as quickly as spinach but produces a very much heavier crop, and in most districts a February sowing will provide greens during the spring and in the winter too if growing conditions in the autumn are good. In most districts spinach may be sown until winter frosts put a stop to growth.

Both crops can be either sown and

thinned in rows where they are to remain or sown in boxes or seed-beds and transplanted. The soil should be well drained and cultivated and if it is at all acid the application of lime at the rate of 2 to 3oz. a square yard

light, in rows 12 to 15in. apart (the greater distance for silver beet) and later, if necessary, thin the spinach 4 to 6in. apart. The silver beet should be thinned 8 to 10in. apart in the rows. When the young plants are established liquid manure at weekly intervals will assist in stimulating development and produce crisp, succulent growth.

HANDY TABLE FOR MEASURING GARDEN FERTILISERS

Fertiliser	Number of level tablespoons per oz.
Bone meal ..	3½
Blood and bone ..	4
Lime (hydrated) ..	3 + 1 teaspoon
Lime (carbonate) ..	2½
Nitrate of soda ..	2
Potash (sulphate) ..	3½
Potash (muriate) ..	4
Sulphate of ammonia ..	2½
Sulphate of iron (not calcined) ..	2½
Superphosphate ..	3

N.B.: Variation in size of tablespoons is one of the factors which makes this table only approximate. The table is convenient for general purposes, but should not be used if absolute accuracy of quantities is important.

will benefit the crop. The humus requirement is high and the addition of composted material or a green crop dug in some time before sowing is an advantage on most soils. The addition of blood and bone at the rate of 3oz. a square yard or a mixture made up by weight of 3 parts superphosphate and 1 part sulphate of ammonia broadcast at the rate of 2 to 3oz. a square yard and well worked into the soil before planting will be beneficial on most soils.

Sow the seed $\frac{1}{2}$ to 1in. deep, according to whether the soil is heavy or

Spring Cabbage

Home gardeners can either buy spring cabbage plants in late autumn or sow seed in February. One or more successional sowings may be made according to the district or period over which it is desired to spread harvesting. Spring cabbage is of the pointed type and the variety usually chosen for autumn sowing is Flower of Spring. This variety was originally produced in England and is especially suited to autumn planting, as it withstands better than most varieties the check to growth which usually occurs during winter, and then in the improved conditions of spring it grows vigorously and quickly forms a good heart. Few plants grown as annuals are capable of doing this with certainty; most of them quickly go into seed development and fail to develop vegetatively if given a severe check after a certain stage of growth. Even with this type of cabbage, however, much depends on the stage of growth and the severity of the winter. To get early crops most growers like to sow early, but too early sowing is likely to result in premature seed development or extensive damage to the soft autumn growth if severe winter weather is experienced.

THE HOME GARDEN . . .

Spring cabbage fulfils such an important role in the scheme of supply that it deserves the best possible conditions. Seed is best sown thinly $\frac{1}{2}$ in. deep in rows 12 in. apart in a well-drained, deeply-dug soil that has been finely cultivated and is rich in humus. Soil lacking in humus can be improved by the addition of compost or similar well-rotted organic material, or, if this is not obtainable, blood and bone at the rate of 3 oz. a square yard can be dug in before sowing the seed. Good varieties for autumn sowing in most districts are Flower of Spring, Wheeler's Imperial, and Early Offenham. In northern parts of the North Island, where winter weather is less severe, a number of other varieties give satisfactory results.

Tomatoes

To the work of cultivating, pruning, tying, and spraying tomatoes will now be added the more pleasurable task of harvesting. Fruit snaps off cleanly at the first joint if it is grasped in the hand with the finger and thumb holding the stem and twisted sharply back. Where there is abundant growth and the fruit is ripening too slowly because it is shaded by foliage it is advisable to cut back the covering foliage with a sharp, clean knife to about half its length. Pruning back the foliage where growth is heavy has

the added advantages of making spraying easier and of enabling the air to circulate more freely, so providing less congenial conditions for the development of disease spores. In northern and central areas the plants should be sprayed with Bordeaux or a suitable copper fungicide at intervals of two to four weeks, according to the local severity of the disease and weather conditions. Where tomato stem borer and looper caterpillar are troublesome arsenate of lead should be added at the rate of 2 oz. to four gallons of spray.

The stem borer moth is an insect $\frac{1}{2}$ in. long with the wings closed; in this position the insect is wedge-shaped and conspicuous. The colour is greyish-brown with a dark brownish area on each side. The eggs are laid on tomato leaves and the young caterpillars tunnel in them and down to the main stem via leaf petiole and branch. As pupation takes place in the stem, plants should be burned after the crop has been gathered. The insect also occasionally attacks potato tubers, so potato tops, too, should be burnt. The tomato looper caterpillar is variable in colour and, like the stem borer, is rarely seen in southern districts.

Late Autumn and Winter Vegetables

No time should be lost in setting out late autumn and winter greens. Early in the month well-grown leeks,

savoy cabbage, winter cauliflower, and curly kale can be planted as advised in last month's "Journal" if the soil has been properly enriched. It is, however, rather late, and in districts which experience a relatively short autumn the measure of success achieved will depend largely on weather conditions.

GREEN MANURING AND SOIL FERTILITY

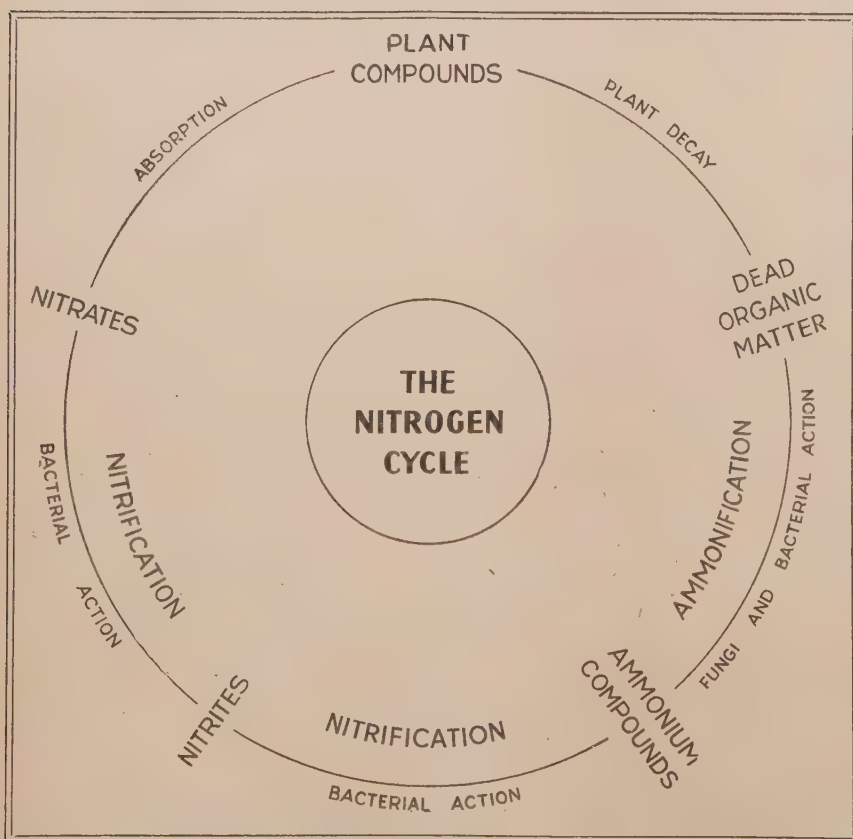
As harvesting progresses land becoming vacant and not required for vegetables should be forked over and sown with a cover crop. This practice is known as green manuring and is not strictly a substitute for animal manure, as, except where legumes are sown, it does not add materially to the stores of plant food in the soil. It consists of growing a crop for the special purpose of digging it in to increase the supply of organic matter in the soil. For satisfactory results the crop grown must be vigorous and of rapid growth, but even a crop of weeds, provided they are not allowed to flower and are not of a twitchy habit, may often be put to good use. Chickweed, fat-hen, spurrey, and red-shank can be utilised, but couch or other twitches, docks, sorrel, and yarrow are unsuitable, and any attempt to use them would result only in a worse growth of weeds.

Leguminous crops such as peas, vetches, and lupins are excellent, as legumes have the power of fixing the free nitrogen of the atmosphere in the nodules on their roots. Dug into the soil the roots, stems, and leaves contribute a valuable supply of combined nitrogen and organic matter. The combined nitrogen is slowly liberated from its compounds by bacterial action and ultimately appears as nitrate, in which form it is taken up by the plants. Apart from nitrogen the large quantity of organic matter supplied by digging in a green crop greatly improves the physical properties of the soil.

The non-leguminous crops grown for green manuring have not the power possessed by leguminous crops of increasing the amount of nitrogen in soils, but their growth prevents losses of nitrates which they take up and which might otherwise be lost through drainage. Examples of non-legumes grown as green crops are mustard, barley, oats, rye, and rape.

Though it rarely applies to green crops sown at this season of the year, it is as well to remember that the green manure crops draw heavily on the soil water content, and when a vegetable crop is to be sown or planted in late summer or early autumn immediately following a green crop there is often a very real danger that the soil moisture may have been unduly reduced by the green crop.

It is important, too, that the vegetable matter to be dug in should not be allowed to become too woody. As a rule it should be turned in not later



than the first flowering stage. The conversion of plant tissues to a form which may be assimilated by the plant is carried out by bacteria, of which there are many species in the soil. Specialised groups each perform a definite function. Most are saprophytic, that is, they live on dead organic matter such as animal or plant parts, excretions, etc., which may be dug into the soil. Provided there is moisture enough they multiply enormously in the presence of food, but when the food supply is depleted most of them disappear, for the microbial population of the soil is not static but dynamic. Bacteria and also fungi break down nitrogenous substances to ammonia, upon which plants feed; specialised bacteria work on the excess ammonia and the nitrate which is then available is usually considered to be the most easily assimilated form of nitrogen. Thus fungi and a series of different bacteria work in a linked progression to produce food in an assimilable form for the plant from the most diverse and often unexpected material. The cycle of events which is continually taking place is simply illustrated in the diagram on the opposite page.

The importance of continually adding organic matter to the soil is realised by all successful gardeners. Apart from the high nitrogen content of some leguminous green crops, they have value in other directions. The state of greenness or succulence of a material is very important. It is not always realised that when straw or other material deficient in nitrogen is added to the soil it is advisable to add sulphate of ammonia or a fertiliser of a similar nature at the rate of

at least 6lb. per cwt. of strawy matter to reduce the carbon to nitrogen ratio close to 10 to 1. This speeds up rotting so that the temporary nitrogen-starvation effect is avoided and the organic material is converted more speedily to a balanced plant food.

Owing to the need for continuous and usually intensive cropping, most home garden soils are lacking in organic matter, and it is therefore most important to dig in any available organic material; all rubbish which is free from insect pests and diseases should be returned to the soil either via the compost heap or dug directly in. The average home gardener is unlikely ever to be in the happy position of having available more organic material than his garden requires.

SEED SAVING

The cost of seed is such a small item that for most home gardeners it should not prevent obtaining the very best, as it is false economy to use inferior seed. Nevertheless, though the saving in cash may not be great, there is some satisfaction in saving one's own seed. Seed can be saved from disease-free self-pollinated plants with reasonable safety, but the precautions to be observed in saving seed from cross-pollinated plants (that is, plants which obtain their pollen from other plants) are such that for the home gardener without specialised knowledge seed saving from them is inadvisable. For the purpose of seed saving vegetables can be grouped as follows:—

(a) Those in which cross-pollination does not amount to more than 5 per cent. (which for most practical purposes may be ignored): Beans, broad and french (runner beans

THE HOME GARDEN

are known to be cross-pollinated), tomatoes, lettuce, endive, egg fruit, capsicums, and peas.

(b) Plants naturally self-pollinated but in which cross-pollination may often occur under natural conditions: Cucurbits (pumpkin, marrow, cucumber), celery, carrots*, and parsnips*.

* May cross with wild types.

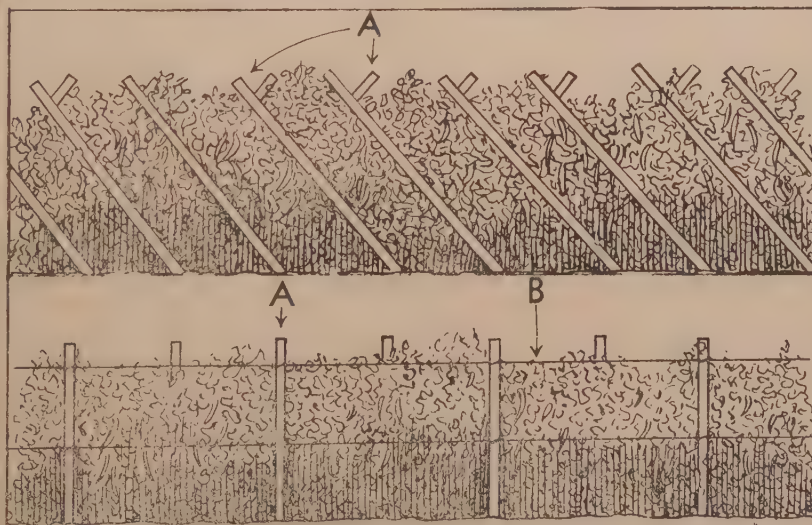
(c) Plants naturally cross-pollinating: Asparagus, beetroot, broccoli, cabbage, kohlrabi, onion, radish, spinach, sugar beet, mangold, garden beet, and spinach beet.

The home gardener who intends to save his own seed must watch a number of important points apart from the danger of cross-fertilisation. Plants which show any deviation from the normal, unless it is a desirable character such as high yield or early maturity, should be rogued early. Many diseases are seed-borne and plants from which seed is to be taken should be healthy and true to type. Pods or fruit should not be malformed or discoloured. It is not usually advisable to select seed from a healthy-looking plant growing next to diseased ones, as the seemingly healthy plant may also be in the first stages of infection, though occasionally disease-resistant stock can be built up from such plants. Flavour and succulence or lack of "stringiness" are important, and plants which "bolt" or go to seed early should be rogued at once.

It is usual to dig root crops such as parsnips and carrots when mature and rogue roots with undesirable characteristics, replanting the remainder so that seed is produced late the following spring or in the summer. Most vegetable crops are biennials and require one season for growth and a second to produce seed. Examples are root crops (carrots, parsnips, etc.) and celery, cabbage, cauliflower, brussels sprouts, kale, onions, and leeks. Seed can be obtained in one season from most annuals and some crops grown as annuals, for example peas, beans, tomatoes, and cucurbits; also from most established perennials, for example, rhubarb and asparagus.

Climatic conditions have a considerable bearing on seed production and the weather should be dry and sunny while the seed is maturing, or diseases such as mildew or botrytis may be troublesome. If special characters are required in a stock, the fertilisation of the flowers must be controlled by isolation, or, very rarely with vegetables, by the removal of the pollen-bearing anthers or top of the stamens (the male parts) of the flowers of the plants selected to produce seed, so that the stigmas, or female portions, are fertilised only by the desired type of pollen. Selection plays a very important part in raising stock.

SIMPLE METHODS OF STAKING PEAS



Upper—Stakes (A) stuck into the ground at a slope at frequent intervals on either side of the row. Lower—A double row of strings (B) tied to stouter stakes (A) placed upright at less frequent intervals on either side of the row.

Precautions Necessary in Dipping Sheep

By J. E. DUNCAN, Wool Supervisor, Wellington.

ON most New Zealand sheep farms dipping is not a matter of choice but something that must be done to comply with the law. That provision is wise and ultimately in the interest of all sheep owners, as it has meant that external parasites for the most part have been kept down to tolerable levels over the years. Without compulsion probably a majority of farmers would still dip their sheep, but their efforts would be offset by the failure of the remainder to keep their sheep clean. However, the outstanding point is that, whether dipping is done voluntarily or under compulsion, it should be done thoroughly. Slipshod methods cost as much in the first instance and a lot more in the long run when losses and the reinfestation of sheep with parasites are taken into account.

THE object of dipping is to rid sheep flocks of lice and sheep ticks, for while they are present sheep do not fatten nearly so well because of the continual irritation and restlessness caused by biting and blood-sucking parasites. Infested sheep rub themselves on posts and wire fences, even losing patches of wool, while clean sheep spend this time placidly eating or ruminating. Apart from the loss of blood caused by parasites, the value of wool is lowered by excessive staining when many ticks are present in the flock.

A clean flock is evidence of a high standard of sheep husbandry and an owner who takes a pride in the management of his flock. In these days, when the call is for increased production of both meat and wool to aid Britain, a higher fattening rate and an increased weight of carcass and fleece will result when the sheep are kept free from vermin of all kinds.

Dangers to be Avoided

Certain precautions must be taken if dipping is to be successful and the desired object of increased production achieved. Dipping can hardly be regarded as a natural process, nor is it conceivable that swimming in a witch's cauldron of poisons and chemicals was one of the normal hazards that Nature evolved the sheep to withstand. Therefore, the taking of all reasonable precautions to minimise the risks to which the sheep are exposed is largely a matter of common sense, and if the principal recommendations set out in this article are followed, losses should be eliminated, or at least kept to a minimum. Losses generally fall under the headings of

1. Mechanical pneumonia, caused by sheep getting dip into their lungs;
2. Ordinary pneumonia, brought on by chilling;
3. Absorption of the dipping poisons through wounds;
4. Blood poisoning resulting from dirty dip entering wounds and abrasions;
5. Poisoning by swallowing dip; and
6. Deaths from shock and exhaustion among sheep in very low condition.



Sheep for dipping should be mustered in ample time, preferably the night before. They should be held in the yards overnight to empty. Sheep overheated after a long drive should on no account be dipped.

PRECAUTIONS NECESSARY IN DIPPING SHEEP

Order of Dipping

The usual order is to put the ration sheep (or "killers"), wethers, and store sheep through the dip first, then the ewes, next the rams, and finally the lambs. The reason for this order is that the store sheep, being the hardiest, take the chill off the wash for the ewes, which still further warm it up for the rams, with which the least risk must be taken because of their value. Finally, after the other sheep have been dipped, the wash can be diluted to the correct strength for the lambs.

Dip manufacturers usually recommend a weaker dip for lambs and for Merino sheep, because both have tender skins which are easily scalded by a wash which is too concentrated, particularly an arsenical one. Apart from that, the very dense fleece of the Merino absorbs and holds a greater quantity of the fluid than does the more open wool of crossbred sheep.

Weather Conditions

The best weather for dipping is moderately cool with low humidity—that is, good drying conditions. Very cold weather is obviously to be avoided because of the risk of chilling, but, contrary to the opinion of a number of farmers, very hot weather is not the best for the work. Where dipping must be done under very hot conditions, which are frequent at this time of year, it is wise to cease dipping during the hottest part of the day.

A good plan, in more ways than one, is to bring in the sheep the previous evening and yard them overnight, starting the dipping first thing in the morning. That gives the sheep plenty of time to empty and ensures that the bath and draining pens are not unnecessarily fouled with droppings. It also guards against the sheep entering the wash when they are overheated, which is likely to result in scald.

If dipping must be done on cold days, it should finish at noon, so that the sheep have time to dry and get a



Wounds caused by biting dogs during mustering of sheep for dipping have no chance of healing before sheep enter the dip and are a ready source of infection; if extensive they may also lead to absorptive poisoning.

feed before nightfall. The latter consideration is particularly important, because a full-bellied sheep does not die from cold and exposure nearly so readily as an empty one. Even on hot days dipping should cease in time to let the sheep dry before dark, as warm days are frequently followed by cold nights.

Sheep should not be dipped when they are wet after rain, as the dip is diluted and penetration lessened. A light shower after the dip has dried in the fleece usually does little harm, though a fairly heavy shower falling before the sheep have dried properly is nearly always detrimental and in some cases may lead to scald by washing the dipping ingredients down on to the skin in increased concentration. If sheep with a fairly good growth of wool have been dipped with one of the better-class poisonous dips (powder or paste) and have had time to dry properly, even a lot of rain does not have any serious effect on the efficiency of the dip.

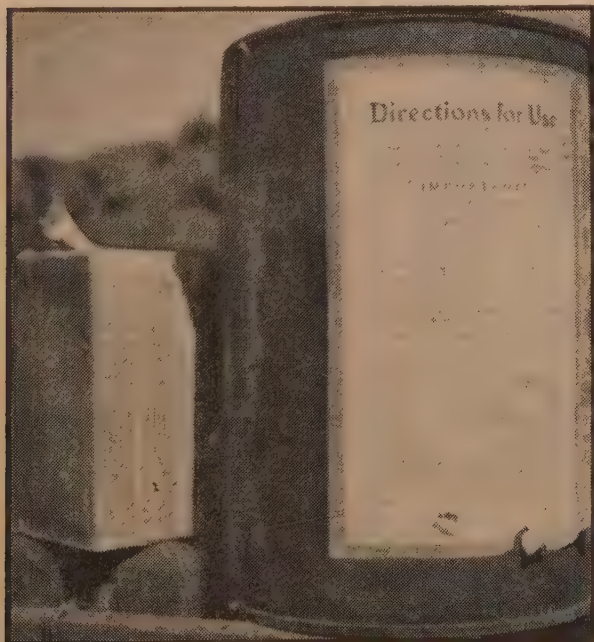
Mixing the Wash

The two most common causes of unsuccessful dipping are inefficient preparation of the dipping fluid in the bath and insufficient time of immersion of the sheep.

The manufacturer's instructions for mixing the dipping preparation must be followed to the letter. The dip is known to have the best effect when it is prepared under a certain exact set of conditions, which have been worked out carefully by the maker and are not given to be "improved upon" at the discretion of the user.

Mixing must be done carefully, particularly with powder dips. The dry powder should never be added directly to the bath; that may appear obvious, yet it has happened on occasions. After the initial mixing and soaking of the powder overnight in tins or drums the resulting creamy paste must be diluted with more water and stirred thoroughly. It should be poured into the bath through a sieve to catch any lumps that may have remained.

Special mention should be made of the new "Gam-mexane" dips which are now coming on the market. In some of these dips the active ingredients are composed entirely of insoluble material, which is carried by the water either as an emulsion or as a suspension. That will



Printed labels on packets and drums of dip contain manufacturers' directions for the most effective mixing and use of the contents. The best results can be obtained only by following them to the letter.

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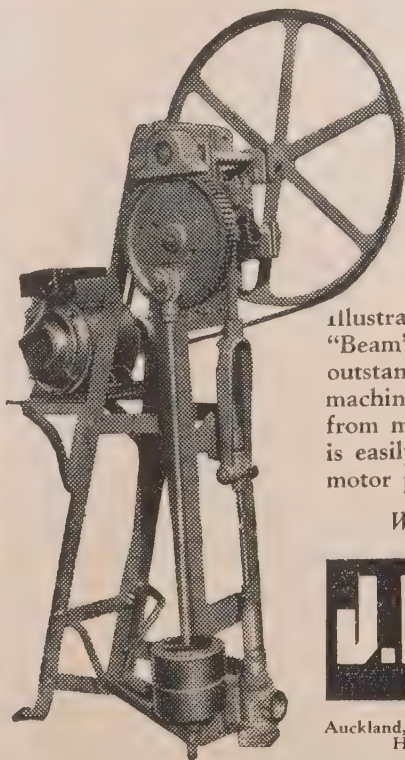
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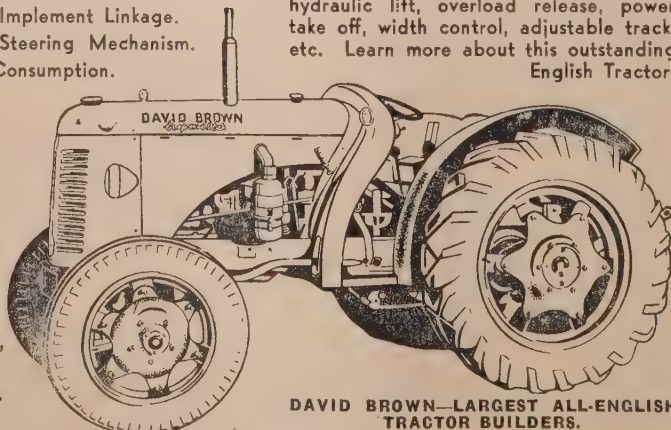
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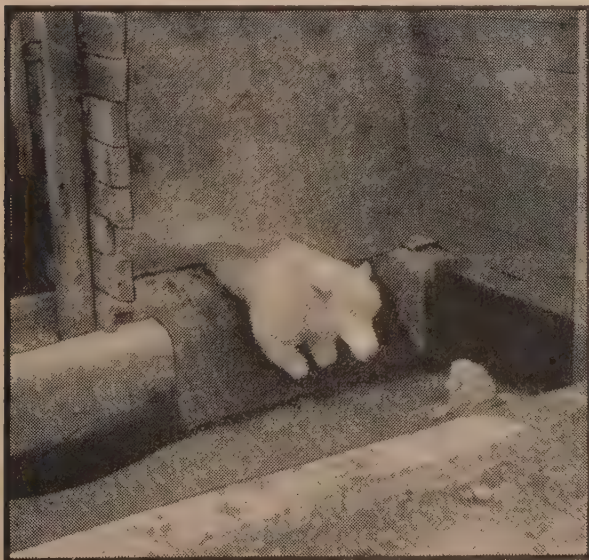
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probably apply also to certain D.D.T. dips which may be sold in New Zealand. In a few of the older dips all active ingredients were in true solution; in others with more than one active ingredient some constituents might be in solution and others in emulsion or suspension. It is important to recognise these differences. Where all ingredients are in solution no exhaustion can occur, and the wash which flows back from the draining pens has the same strength as that in the dipping bath or in the well of a spray dip. With emulsions or suspensions, on the other hand, the fleece has a filtering effect and removes some of the tiny globules or particles, thus weakening the dip. Therefore the wash flowing back from the draining pens is slightly less concentrated than that in the dip. This exhaustion or "stripping" of the dip is progressive, and if not corrected, the dip may eventually be weakened to the point of inefficiency.

"Stripping" or exhaustion has long been recognised, but with dips composed mainly of powerful poisons such as arsenic and carbolic nothing could be done to correct it, because the margin between the strength necessary to kill parasites and that which might be dangerous to the sheep was narrow. Where the new insecticides "Gam-mexane" or D.D.T. are combined with poisonous ingredients these remarks still apply, but these new materials are so innocuous to sheep that they can be used by themselves at concentrations far above normal dipping strength without risk. Advantage has been taken of this knowledge in framing instructions for their use and these should be carefully followed.

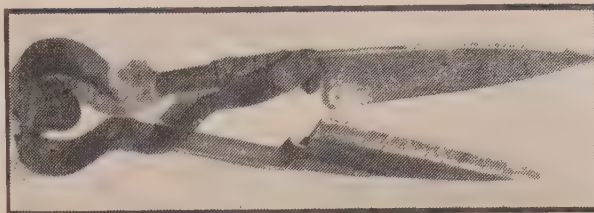
In general they call for frequent replenishments at a strength somewhat greater than that used in originally making up the bath. That compensates for the "stripping" effect and keeps the effective strength of the dip up to standard.

Farmers may complain that following out these instructions involves extra work, but they are really little trouble, especially if a mixing tank is used. The alternative would have been for the dip manufacturers to recommend a uniform concentration for both charging and replenishing the bath. The only drawback would have been that this method would use a little more dip and so would cost more. In any case, the great advantages of safety and effectiveness of the new dips far outweigh the slight extra trouble.



The wrong way to dip. Sheep should not be dumped into the dip head first, as they are then much more likely to swallow or "aspirate" the wash.

DIPPING OF SHEEP



Shear cuts and wounds from projecting nails in the yards not properly healed by dipping time are likely to lead to infection.

Capacity of Bath

When a new dip is built measured quantities of water should be run into it and calibration marks chiselled into the concrete. If a marked dip-stick is to be relied on for gauging the contents the marks on the stick should be duplicated on some permanent object such as a doorpost in case the stick is lost. If no measuring vessels are available the water can be weighed; one gallon weighs exactly 10lb. When the bath is left standing for some time carefully note the level of the wash. Evaporation calls for the addition of more water; dilution with rain water requires additional dip.

The sheep alone should not be relied on to keep the dip agitated, especially with a powder dip. Proper stirring with a plunger is necessary at regular intervals, and particularly after any lull in the dipping. Power spray dips score here, as they stir up the wash very efficiently, and some are fitted with a special agitator for use after a break in the dipping.

Removal of Impurities

During dipping no scum should be allowed to accumulate on the surface of the wash, because with a powder dip this scum holds large quantities of dip particles and is so concentrated as to be very dangerous if accidentally inhaled by the sheep. In non-poisonous dips scum is also undesirable because the organic matter it holds tends to reduce the strength of the wash. It should be removed continuously by a wire gauze skimmer, or, in the case of a swim bath, an ordinary fine-toothed garden rake is a useful implement.

All other gross impurities such as sheep dung and vegetable matter should be removed. They not only foul the bath and the sheep but if left they sink and carry down with them appreciable quantities of dip particles, which are locked up in the sediment and made useless. It is also held that accumulated organic matter has a rapid deteriorating effect on the carbolic type of dip. One of the advantages of modern spray dips is that they incorporate an effective screen of large area which removes a large amount of impurities which normally get back into the dip.

A clean wash does not deteriorate appreciably if left standing for a few weeks, but dips of the non-poisonous type, because of their volatile constituents, lose strength if left too long. A very foul wash changes both chemically and through bacterial action if left for long and is then not safe to use again. It is also likely to stain the wool permanently. The other common cause of dip stain is an insufficiently-mixed wash.

The dip manufacturers, though they would like to, are reluctant for trade reasons to recommend any definite number of sheep after which the wash should be discarded. The reason is that if one maker conscientiously recommended emptying the bath after dipping 6000 sheep, he might lose trade, because some of his rivals might claim that their dip was better because it could dip 10,000 sheep. It might, but how effectively?

A point not generally realised is that if the dip is used too long, it becomes so charged with suint from the fleeces of

DIPPING OF SHEEP . . .

the sheep passing through that it becomes in effect a very dirty scouring bath. It then tends to remove some of the yolk from the wool, which is left unattractive and dirty. At present there is no accurate test of when to discard the wash, but no doubt such a test could be worked out if there was a demand for it.

Thorough Immersion

Insufficient immersion is the second great cause of unsuccessful dipping. For best results the wash must reach and thoroughly saturate the skin of the sheep, and in sheep carrying a good growth of dense, greasy wool that takes an appreciable time. The makers of practically all dips recommend a minimum of one minute in the wash to safeguard both the farmer from unsuccessful results and themselves from complaints about the failure of their dip.

It has been found that complete saturation can be obtained in less than a minute with lambs and short-fleeced sheep, but for sheep carrying a heavy, dense fleece a full minute is desirable. Therefore the manufacturers are quite justified in recommending this as a minimum, and the conscientious man will examine the first few sheep through the wash to make sure saturation is complete.

When using a power spray dip no attempt should be made to break speed records. This type of dip is fast in any case, but if it is to do a good job, sufficient time for thorough penetration must be given. The makers of spray dips give the minimum time of immersion required with each type, and those times should not be reduced. Where the design allows, it is better to operate the top and bottom sprays alternately for two minutes each, giving each set the full pressure available and thus ensuring good penetration, than to have all sprays on at once.

Low temperatures and hard water (which can be used with powder dips and some of the new "Gammexane" dips) both tend to retard the penetration of the wash, but high temperatures are likely to lead to scalding. A few farmers appear to think that increasing the strength of the wash will compensate for a short immersion; that is a fallacy and is likely to be doubly expensive, because of the greater quantity of dip used and the scalding likely to ensue.



Sheep put in singly rump first get the least possible knocking about and there is less chance of their swallowing the dip or getting it into their lungs.



The right way to dip. When sheep are put into the dip singly, by hand, the best method is to slide them in gently, rump first.

Condition of Sheep

Sheep which are dirty round the hindquarters should be daggled before being put through the dip to prevent undue fouling of the wash. Leaving sheep in the yards for a while to empty has been mentioned, but care should also be taken to see that they are not thirsty, as there is a danger that they may swallow some of the wash or lick each other while in the draining pens. Dipping sheep on a full stomach gives them a bigger shock and may lead to drowning or, in extreme cases, a ruptured diaphragm if they struggle violently.

Sheep should not be put through the bath straight from a long drive or hot and panting after being dogged round the yards, first because their pores are open and a certain amount of scalding is likely to result and secondly because, by their rapid breathing, they are likely to aspirate the wash into their lungs and contract mechanical pneumonia. If they are bitten or heeled by the dogs, there is a danger of poisoning through such wounds.

Rams in condition for service, or other sheep or lambs in high condition, should not be dipped unless it is essential, though sometimes if infested rams are bought in just before tupping dipping cannot be avoided. Apart from the fact that such rams are in an excitable condition, their skin is usually flushed and very liable to scald. Heavy, unwieldy rams are also naturally bad swimmers, and care has to be taken in piloting them through the bath. An extra precaution with valuable stud animals is to put a bridle on each ram to assist in controlling it, and frequently it is advisable to immerse these animals only once. If ewes have been dipped shortly before service, a week should be allowed to intervene before the rams are turned out.

Sheep in very low condition should not be dipped, but if that cannot be avoided, they will need special care to prevent drowning. Neither should very hungry sheep be dipped, as they cannot resist the shock so well.

Ewes may be dipped up to within two or three weeks of lambing if they are carefully handled and assisted through the bath. Spray dips are particularly advantageous in this case, as they involve the minimum amount of knocking about.

Though dipping lambs 10 weeks old or over is quite safe, dipping unweaned lambs is not really desirable, not so much because of the danger of dipping but rather because of the danger of mismothering, which is considerable, because ewes know their lambs by smell, which the dip partially hides.

If ewes and lambs must be dipped, they must be separated and the lambs kept away from their mothers for two or three hours until the ewes are quite dry.

If sheep have been given an arsenical worm drench, it is a wise precaution to allow a week to elapse before putting them through an arsenical dip or the amount of arsenic getting into the system may be excessive.

It is essential that every sheep on the farm should be dipped, and if for any reason, such as sickness or wounds, sheep cannot be dipped at the same time as the others they must be isolated until it is possible to do the work. If at all possible, it is also wise to dip about the same time as the neighbours, for only by constant vigilance of this sort can a flock be kept clean.

Sheep should not be packed tightly in the draining pens or they will rub and chafe together and scalding is likely to result. That cannot be blamed on the dip, for an instance is known in which some Southdown hoggets wet with rain were tightly penned in the woolshed for a while, and that was sufficient to cause them to scald and lose big patches of wool afterward. The sheep must be allowed to remain in the draining pens until they have stopped dripping mainly to economise with the wash but also to some extent to prevent dripping on the herbage.

After being drained it is desirable that the sheep be allowed to dry in the shade because, apart from minimising the risk of scalding, slow drying enables the dip particles to become evenly distributed through the fleece, giving maximum and lasting protection. Sheep must not be started at once on a long drive while still wet with dip; they will heat up, absorption of dip will take place, and scalding is almost sure to follow.

Follow Instructions

Reputable dip manufacturers take every care to see that their products are thoroughly tested and standardised before being offered for sale, and are also careful to maintain this close supervision through all stages of manufacture. They always supply with the dip full instructions for its use, but further than that they cannot go.

The dip is merely a tool in the hands of the farmer for accomplishing a definite task, and if he chooses to ignore the instructions, he can no more blame the dip for killing his sheep than he can blame his motor-car for knocking down a pedestrian if he handles it wrongly.

In spite of any claim made by farmers writing testimonials, or even by the manufacturers themselves, dipping cannot improve the wool on clean, healthy sheep. The wool which has already been grown cannot be improved, though it

can easily be damaged in a variety of ways, but dipping, by ridding a sheep of parasites, can improve its general condition and consequently indirectly improve the wool which is yet to be grown.

Causes of Losses

Finally, the causes of losses which were mentioned earlier may be considered in a little more detail.

1. Mechanical pneumonia: Caused by rough handling of sheep in getting them into the bath. That leads to sheep aspirating the wash, some of which enters their lungs and causes mechanical pneumonia. Rough hand-

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ling includes tumbling too many sheep into a pot bath, resulting in abrasions and some sheep submerging others, and also dipping when the wash is too low in the bath.

2. Ordinary pneumonia: Brought about by conditions already explained—for example, empty-bellied sheep not drying before nightfall. Rams and other sheep in high condition are particularly susceptible to chill, and a sudden storm or unseasonable cold snap can bring about considerable losses.

3. Absorption through wounds: Extensive wounds such as shear cuts and dog bites may allow the absorption of

... DIPPING OF SHEEP

sufficient arsenic or carbolic to cause poisoning. Some of the new "Gammexane" dips have the advantage that they contain no poisonous ingredients.

4. Blood poisoning: Arsenical dips have much less germicidal value than is often supposed, and even a carbolic type of dip may infect a wound if the wash is allowed to become very foul. The ends of the dipping crutch should be quite blunt. A case is known in which the crutch had gradually become worn on the concrete until the points were sufficiently sharp to cause punctured wounds on a number of the sheep below the jaw; several losses resulted from these wounds becoming infected with the bacillus of malignant oedema (blood poisoning).

5. Poisoning by ingestion: Contrary to general opinion, post-mortem examinations of sheep lost at dipping have shown that only very rarely is death caused by poisoning from swallowing of the wash. In most cases the dose they swallow has no more bad effect on them than many of the poisonous drenches given to rid them of worms. From time to time cases are recorded of sheep being poisoned by eating herbage contaminated with poisonous dip which has dripped on to it from insufficiently-drained sheep, but even then the degree of contamination is seldom high enough to be fatal except from herbage in small pens packed with wet sheep. What has happened too frequently, however, is that other stock, such as calves, have been poisoned by chewing empty dip packets which have been left lying about. That is only the result of gross carelessness, as the packets can easily be destroyed by burning.

6. Shock and exhaustion: There are always a few sheep in a large flock in a precarious state of health but not recognised by the farmer. A sheep may have very delicate lungs and the slight chill from dipping, which has no effect on healthy sheep, may be sufficient to cause its death from pneumonia. Again, hoggets are often very weak through worm infestation but the owner may believe the weakness to be caused by the external parasites which are also present; the shock of dipping can be just sufficient to kill these sheep instead of giving them a fresh start, as the owner erroneously thought it would.

Dipping losses are largely preventable and where they occur are nearly always the fault of the user rather than of the maker of the dip. A thousand sheep saved from death are just as valuable an acquisition to the country's wealth and production as a thousand extra lambs reared.



On hot days dipped sheep should be allowed to dry in the shade to prevent scald, and for the same reason they should never be driven far while still wet.



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FARM WORK FOR FEBRUARY

By the Fields Division.

CROPPING WORK

Harvesting: Harvesting of many cash crops and grass and clover seed areas makes February one of the busiest months in many districts. The attention of farmers with grass and clover seed to harvest is directed to the article by E. G. Smith, Fields Instructor, Rangiora, on page 47 of this issue. Care should be taken not to begin heading wheat till the crop is ready. The services of the Wheat Research Institute are available for testing moisture content of wheat before harvest.

Cultivation: Land should be turned over as soon as practicable after harvesting in preparation for the following crop. Because of the rush of other work on mixed farms at this time there is a tendency to leave preparatory cultivation too late for best results. The telescoping of all cultivation operations into the few days before sowing the next crop is not good farm practice under any conditions.

Crop Rotation: The opinion that a particular variety of wheat, potatoes, or other crop is "running out" or is "not as good as it used to be in the old days" is frequently expressed by farmers. Though this may be partly correct, intelligent study of practice on farms of those who complain of "running out" often shows that the theory originates from a wrong conclusion. If the type of farm management leads to a gradual deterioration of the soil, a farmer may imagine that the seed or fertiliser rather than the method of farming is at fault.

On some mixed farms some or all of the following crops have been alternated year after year: Wheat, peas, potatoes, oats, and barley. Peas is the only crop among these which is not ultimately soil exhausting; land farmed indefinitely in the others must show deterioration.

Ways to improve such a rotation are:—

1. Crops which are fed off on the spot, such as rape and turnips, may be added to the rotation, as droppings of animals grazing the crops add to the fertility of the soil.
2. Green manure crops for ploughing in, such as lupin, may be grown to raise the organic matter and nitrogen content of the soil.
3. The surest way to restore soil fertility is to sow down to a clover-rich pasture for at least two years.

Greenfeed Crops: Areas of Italian and short-rotation ryegrass, the value of which for greenfeed is well known, can be sown with good results this month. Other greenfeed crops which can be sown shortly are blue or sweet blue lupins and greenfeed oats or barley. Land should be prepared now for sowing these crops in March.

Feeding off Rape Crops: Rape crops should be fed off in breaks and a grass run-off provided if possible. Lambs should be gradually accustomed to the crop. Grazing of the crop too soon after a wet spell may result in deaths from bloat.

GRASSLAND WORK

Topdressing and Liming: The efficiency of many farms may be measured by the effectiveness of the use of phosphates and lime. On two similar farms equal quantities of fertiliser may be used with vastly different results. Points which should be considered in the application of fertiliser are:—

1. The time of application. February to April topdressing in most districts usually results in improved growth during late autumn to early winter, as well as in early spring.
2. Type of fertiliser. Only that which use and experiment have shown most suitable for the land should be used.

3. Type of pasture topdressed. It is usually more profitable to topdress the younger and better pastures.

4. Use made of growth. Fertiliser is wasted if full use is not made of the grass growth resulting from its application.

Pasture Management: Deficiencies in the quality of pastures available to stock are frequent at this time of year. In districts where dry conditions are usual the deficiency may be in both quality and quantity of feed, but in others quality only may be deficient. To maintain milk production on dairy farms at this time the primary need is for leafy growth, which is not naturally produced by pastures in late summer. Where growth is rank and flower heads have developed "topping" with the mower will help to produce fresh leafy growth and may also check weeds such as thistles, docks, redshank, etc. Areas shut for seed or hay should be available to furnish valuable feed now or shortly.

Pasture Establishment: Autumn is the usual time for pasture sowing in many districts. As pasture is a permanent crop, preparation for it should be more thorough than for perhaps any other crop.

LUCERNE

Lucerne may be cut and fed out green at this time if the feed position warrants it or lucerne paddocks may be grazed under careful control. Sowing of new areas may be carried out this month, but the crop should be fairly well established before winter, when the lucerne is dormant but weeds continue to grow.

STOCK

Dipping: Unnecessary losses may occur and the effectiveness of dipping be impaired by failure to observe some common-sense rules which are obvious precautions to most farmers but are neglected by a few. An article "Precautions Necessary When Dipping Sheep," by J. E. Duncan, Wool Supervisor, appears on page 22 of this issue.

Shearing of Lambs: The shearing of lambs is usually carried out this month. Surplus ewes should be sold and new lines of ewes and rams purchased. The tupping season commences soon in many flocks in the North Island, and breeding ewes should be flushed two weeks beforehand. If rape is not available, a change on to fresh greenfeed or young growth of grass is advisable.

Dairy cows should receive ample supplies of succulent feed such as maize, soft turnips, millet, and silage to make up for the dry condition of the pasture, which is common at this time of the year. To prevent taint in milk it is probably preferable to feed turnips at a young stage. The turnips should be pulled and the maize cut and carted to the stock. Such crops are too valuable to permit wasteful feeding methods. Weaned calves should rotate around the farm ahead of the milking herd.

GENERAL

Prevention of Fire: At this time of the year, when pastures are dry in most parts of the country, care should be exercised to prevent an outbreak of fire. Most fires are started through carelessness and in past summers have caused considerable damage, destroying native bush and exotic trees as well as ground cover.

Filling Bog Holes: Opportunity should be taken during the dry weather of filling and metalling gateways, bog holes, and crossings. These areas should be well filled so that the raised surface sheds water and does not retain it and become boggy again.



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The Breeding and Rearing of Ducks



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THE selection of breeding ducks from first-year stock is common, particularly if the owner wishes the eggs to hatch early in the season. Early hatching has advantages when ducks are being raised for table birds, but there is much to be said for retaining successful breeders for several seasons, and in general ducks have a longer breeding life than the average for poultry. In normal times overseas some flocks of first-year ducks are trap nested and the breeding stock selected from these birds, judged on their first-year egg production.

BIRDS having wide, long, and deep bodies are desirable as breeding ducks for egg production. Coarse-headed birds, male or female, should not be used, as heavily-producing ducks invariably have fine heads, and when in lay have well-developed, deep bodies. Every endeavour should be made to select only ducks and drakes which weigh not less than the minima stipulated under the New Zealand Poultry Flock Improvement Plan. Breeding pens should be made up not later than August or September, as the hatching season is in full swing in October.

Two types of matings may be made, by single-drake pens or mass-mated pens. In single-drake pens rather fewer ducks should be allowed to each drake. With the egg-laying breeds such as Khaki Campbells and Runners eight to ten females may be mated to one male, but with the heavier breeds such as the Pekin duck the number should be lower—say five to eight females to one male.

Though mass mating of ducks is common, the best results are usually obtained with single-drake matings.

Satisfactory results can be obtained with breeding pens which do not have access to water for swimming on, but

some experienced duck breeders believe that better results are obtained from ducks which are given the natural conditions of water during the breeding season.

Eggs for Hatching

Eggs for hatching should be collected daily as soon as the ducks are released and should be washed as soon as possible. It is not recommended that duck eggs required for hatching be subjected to a long soaking in water before being cleaned. Providing all mud or droppings are removed, it is not essential for hatching eggs to be cleaned to the extent desirable when they are to be marketed.

Little or no deterioration in hatching results is experienced with poultry eggs kept for 10 days if they are stored

The breeding, incubation, and rearing of ducks on a commercial scale are dealt with in this, the second of a series of articles about ducks by F. C. Bobby, Superintendent of Poultry Husbandry, Wellington. The first article, which discussed breeds and housing, appeared last month, and the third will deal with feeding and the raising of ducks for table birds.

under satisfactory conditions and turned regularly, but it is desirable to set duck eggs for hatching as soon after they are laid as is practicable. Much will depend on how long is required to collect sufficient eggs to fill a flat-top incubator or give a setting for a cabinet machine, but it is recommended that duck eggs should not be held longer than seven days, and there is some evidence to show that eggs held for even that period hatch better under hens than in an incubator.

A cool place should be selected for storing eggs for hatching, and if they are kept for seven days or longer they should be turned daily. Turning daily is less important if the eggs are stored on their ends, small ends downward. Care should be taken to reject cracked or rough-shelled eggs. A good medium-sized egg is desirable, undersized and abnormally-large eggs being better avoided.

Incubation

As with poultry eggs, duck eggs may be hatched by natural or artificial methods. Hens are employed for natural hatching and heavy-breed birds will cover 10 or 11 eggs. Putting too many duck eggs under a hen is not wise, particularly if she is to complete the operation of hatching. As the incubation period for duck eggs is 28 days (35 days for Muscovy ducks) the hens used should be fully broody, in good condition at the start, and free from vermin. Such birds may be freed of vermin by the use of nicotine sulphate, pyrethrum powder, or sodium fluoride.

An important aspect of hatching duck eggs is that they require more moisture than is necessary for hen eggs. Accordingly the hatching coop

BREEDING AND REARING OF DUCKS . . .

or box used for hens sitting on duck eggs should not have a wooden bottom and should be placed directly on moist or damp ground. This natural moisture is of great assistance in duck egg hatching. The floor of the coop may be made of a fine-mesh wire netting to protect the hen and eggs against rats or other vermin. The nest itself should be made of a layer of straw or hay placed on the netting. In dry districts it is often desirable to moisten the ground around the coop with water a few days before the eggs are due to hatch.

All broody hens should be taken off the nest daily for about 20 minutes after the first two or three days. During this period the hen relieves herself, feeds, and drinks. Grain feeding, particularly with maize, is satisfactory for broody hens. The eggs should be checked over seven to ten days after being set and all infertiles removed. Careful observation is necessary throughout the hatching period to detect eggs in which the germs have died and the contents are going bad. Bad eggs are not uncommon among duck eggs during hatching, and should they burst, all the other eggs may be badly soiled and the broody hen may desert the nest.

Incubator Methods

The hatching of duck eggs in an incubator—either flat-top machines or cabinet incubators—is common today, but it is perhaps true that an incubator eminently suitable for hatching duck eggs has yet to be made. The best method of operating an incubator for hatching duck eggs varies to some extent with the type of incubator, and experience with the machine will have to be acquired before the best results are obtained. For that reason some marked divergences of opinion exist among those who have had experience of hatching duck eggs. However, the following points may act as a guide:—

Flat-top machines are usually run at 103 degrees F., with a rise of up to one degree at hatching time. Duck eggs should not be heated up too quickly and the doors may be left slightly ajar during the first six hours. No harm is done if 12 hours elapse after setting before the temperature reaches 101 degrees, and a further two or three days before the limit of 103 degrees is reached. The first 10 days are the critical ones, during which the eggs should be disturbed as little as possible—in fact, it is customary in the United States not to turn the eggs at all until the first test is made at the end of a week, and that method is also adopted by some duck farmers in New Zealand. Duck eggs may be tested for fertility seven to ten days after setting. A daily watch must be kept for eggs going bad; they may be detected

readily by smell in the early days of going rotten.

Opinions vary on the question of cooling duck eggs, but it is suggested that cooling after the first week has advantages for eggs hatched in flat-top machines. Apart from any direct effect that the cooling may have on the embryos, this practice undoubtedly helps in the efficient ventilation of flat-top machines and affords the eggs an increased supply of oxygen. These remarks do not apply to eggs hatched in cabinet machines.

Experiments before the war indicated that a high humidity—say 70 per cent.—is desirable for duck eggs in an incubator during the first week, with a subsequent reduction of about 5 per cent. a week until hatching time, when the maximum moisture is required.

Similar treatment of duck eggs is required in a cabinet machine, except that the temperature is maintained at 100 degrees F. Special trays are required to pack duck eggs because of their greater size than hen eggs.

Rearing Ducklings

Given reasonable care, ducklings are easier to rear than chickens. They require a shorter brooding period during which warmth is necessary and are far less liable to disease. Against that must be set the increased difficulties of keeping conditions clean with ordinary brooding equipment. The usual types of litter such as straw, chaff, and rice husks rapidly become damp, soiled with droppings, and trampled into a messy condition.

If only a limited number of ducklings is to be reared, natural methods can be employed with excellent results. Some form of coop is required for the hen and ducklings for the first few days, and for protection at night throughout the brooding period where rats are likely to cause trouble. Rats and weasels are particularly deadly to young ducklings and protection against these menaces must be provided. If there is a hedge, shrubs, or some other protection to which the hen may take her ducklings during the day to avoid rain, hot sun, or cold wind, such protection as coops during the day is unnecessary. After two or three weeks the ducklings may be taken away from the hen and kept in a pen having a simple open-fronted shelter for protection at night and when necessary during the day. A heavy-breed hen will brood 15 ducklings comfortably.

Ducks may be reared artificially using almost any of the ordinary types of brooders. It is now becoming common to rear ducklings in battery brooders, where they are maintained for two to three weeks. Battery brooders are favoured for their wire floors, which

enable conditions to be kept cleaner and more hygienic than with floor brooding. When the floor brooding method is selected it is desirable to make wire frames for under the hovers to overcome the dirty conditions that ducklings create.

Ducklings should be started at a temperature of 90 degrees F. under the brooders, as with chickens, but the temperature may be dropped more quickly. In warm climates artificial heat may be dispensed with after about a fortnight. Ducklings may be allowed only a very limited range from the hover during the first two or three days; brooder surrounds of wood or metal should be used to confine them to this space. As ducklings produce liquid droppings and grow very rapidly, efficient ventilation in the brooder house or shed and under the canopy of the brooder is essential.

Ducklings may be allowed outside the brooder house pen after two or three days. If grass runs are provided, the grass should be kept short. Wet long grass is not suitable for young ducklings, as such conditions lead to chills. A modern method of running them is to provide a shallow cage outside the brooder house pen raised off the ground and having a fine-mesh wire netting bottom or slatted wooden floor. The ducklings go out into the extensions or cages for food and water and benefit from direct sunshine. With this type of floor the cages remain reasonably clean during the short brooding period.

Plenty of Water Required

The feeding of ducks and ducklings will be described in detail in a later article, but it may be emphasised that ducklings require plenty of fresh drinking water to be constantly available. It is a generally-accepted practice to ensure that the depth of the drinking water is sufficient to permit the ducklings to immerse their heads completely, ensuring that the beaks and nostrils are kept clear of food accumulations and the eyes of sores. The writer was surprised on one occasion recently to see young ducklings provided with a drip-feed drinker and to note no trouble from dirty beaks or sore eyes.

Any simple system of penning on grass attached to a low, open-fronted shelter will suffice for the growing period. It is important to note that ducks are inclined to be nervous and are easily frightened, particularly by dogs, cats, or rats. For that reason it is desirable to run growing ducks in comparatively small units—30 to 40 birds. Less damage is then done if the birds are frightened, as in big flocks ducks are likely to pile up on one another if frightened, causing damage. This point has to be watched when catching ducks in a pen.



REARING AND TRAINING A SHEEP DOG

THE well-trained, obedient sheep dog is not produced hurriedly or without effort. His efficiency is the result of careful attention by his trainer to breeding, selection, and the art of sound training. In this article E. G. Broad, of Cambridge, deals with the breeding and rearing of a sheep dog and the necessary handling and training he must be given from birth until he is qualified to work expertly with sheep.

THE sheep dog is commonly called a working collie or collie dog. The origin of the name collie is obscure, but the most likely explanation is given in a dictionary which suggests that the name collie comes from col (meaning black) and that certain Highland sheep known as colleys because of their black faces and legs were tended by a dog.

The working sheep dog must not be confused with the show-bench collie. The former is superior in intelligence and instinct to all other breeds. Peculiarly shy in disposition, he is usually slow to make friends with strangers, but once he gains confidence through proper treatment his attachment surpasses that of any other animal. His great charm as a companion is his strong attachment and anxiety to please, and this is shown by the way he watches every look and motion of his master and the readiness with which he interprets them. Few dogs possess the active, resourceful brain of the working sheep dog. Sound in generalship, gentle, judicious, slow to anger, and quick to action, he is at his best as a worker. He is ever ready to do his utmost for his master at all times if he can be made to understand what is required of him. This problem of understanding is, with him right throughout life, and too many die as they have lived—perplexed.

The show-bench collie, having been bred for many generations as fancier pets and chiefly for appearance, is not as a rule a suitable dog to select for training for stock

work. His intellectual qualities have been dulled by years of idleness.

BREEDING

There is no doubt that the working sheep dog's close association with man over many years and the greater care in the selection of stock for breeding have developed a more intelligent animal and one better suited structurally to perform the work required of him. Sheep dog trials demonstrate the extent to which the intelligence of these dogs can be developed by training. Breeding for intelligence is far different from breeding to type, where the points are so clearly discernible and faults more easily rectified. In addition, the human factor has to be considered. A moderately-intelligent dog may be developed into a very clever worker by an expert trainer; and an exceptionally-intelligent animal may become only a mediocre worker in the hands of a less expert man.

To breed successfully it is necessary to study carefully the characteristics not merely of the two individuals about to be mated, but those of their respective families for several generations. Experience has shown that there must be a high degree of intelligence for many generations on both the sire's and the dam's side to render their perpetuation highly probable; and it is claimed that disposition, appearance, size, and, in fact, nearly all the qualities of a dog depend much more on his ancestry than on his parents.

It has also been shown that high mental qualities are almost invariably inherited, although there are cases where these qualities have not been passed on, and this applies not only to sheep dogs but to all animals including human beings. Furthermore sheep dogs kept in idleness for a few generations, regardless of how good their ancestral pedigree is from a working point of view, can become incapable of transmitting the working qualities of their ancestors. The more highly educated dogs are the more likely they are to transmit these qualities to their offspring. Therefore it would not be of any practical use to endeavour to build up a strain of working dogs from two individuals

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that for many generations had been bred purely as pets.

Pedigree

A pedigree animal, to be of any use as a breeder, must have been inbred without any deterioration in quality. Its value lies in the ability it has of impressing on its progeny its own form and characteristics; that applies to pedigrees of all animals. An animal with a pedigree in which each generation is a distinct outcross or is unrelated has no ability, whether sire or dam, to reproduce its like simply because there is no predominance of blood of any one strain. This problem of scientific breeding known as inbreeding and line-breeding is generally little understood among sheep dog breeders. Most of them in trying to breed for higher intelligence believe that a good pedigree is of no immediate value to a bad working dog and that the pedigree is of little consideration in comparison with good working blood. The most common error, however, is to expect the union of two champion working dogs to produce champions, for in breeding "like by no means always produces like." What is commonly overlooked is the fact that both the sire and dam also had a sire and dam, which may have possessed very different characteristics from their offspring.

Inbreeding

Breeders who have their own particular strain of working dogs practice to some extent the system known as inbreeding and line-breeding. This method is a study in itself and is undoubtedly advantageous when managed with judgment. By mating a dog and bitch of the same family the uniform inherited qualities can be concentrated into one line instead of two. There is no surer way of maintaining unity of character, and a study of many of the best lines of Border dogs will show how commonly inbreeding is practised. On the other hand, inbreeding has its disadvantages, for it must be remembered that faults are inherited as well as merits, and these faults have a way of asserting themselves with annoying persistency. Furthermore, inbreeding between dogs closely related may lead to physical and mental weaknesses in the progeny.

In practice it has been proved that the union of father and daughter or mother and son is preferable to a union between brother and sister, and the best mating is between cousins. To justify inbreeding, however, care must be taken to see that both parties to the union have the same desirable qualities and do not share the same faults. In short, inbreed good and you get better; inbreed bad and you get worse. This means that if there is

a latent fault in the strain it is almost certain to come out. In the same way virtues should be handed on, but it is always easier to retrogress than progress.

Should a strain be declining in stamina or in danger of extinction, an outcross may be introduced with advantage, providing the working characteristics of the new strain are identical with those of the old strain. This is called outcrossing or cross-breeding, and in many cases it achieves its purpose. Because an animal cannot transmit a quality which it does not itself innately possess or which none of its progenitors has ever possessed, great care must be taken in outcross breeding.

Brood Bitch

A bitch usually is "in season" twice a year. The first time is generally between 7 and 10 months of age. The "heat" generally lasts from 3 to 4 weeks. Her condition is clearly indicated by the increased attention paid to her by the other sex and the appearance of a reddish discharge from the vagina. When these signs appear she should be immediately locked up. As soon as the discharge ceases she is ready to take the dog and will remain for several days in a state when mating is possible. It is a matter for the owner to decide whether a bitch should be "covered" at the first "heat." If the bitch is well grown, a litter of pups will not hurt her, providing she is not required to rear too many. A slow-shaping young bitch will often come to her work much better after weaning a litter.

The young bitch may be a shy breeder and refuse to take the dog. If allowed her freedom for a short time and allowed to ease herself and romp about with the dog, she will probably become friendly and let the dog serve her. It is seldom that any human aid, such as attempting to hold the bitch, can be of any assistance, and it is unsatisfactory to shut the two up together. One service is generally sufficient, but to ensure that conception does occur another service within two days is advisable. Both the mated dogs should be in good, healthy condition and free from worms and skin diseases. A pregnant bitch with worms will produce worm-infested puppies.

Be careful that the bitch is right "off" before letting her associate with other dogs. A bitch is capable of impregnation by two or more dogs during the same "heat" and will produce pups in one litter clearly distinguishable as the offspring of different sires.

Should an undesirable union occur and the dogs become "locked," it is a dangerous practice to attempt to "choke" off the dog. They can be

easily parted by gently but firmly pressing the dog's testicles. If it is necessary to prevent a bitch from breeding after she has gone "astray," syringe out the womb with a solution of alum and water, a solution of condy's fluid, or quinine. This should be done promptly.

In-whelp Bitch

The in-whelp bitch requires little attention out of the ordinary. She will often be unusually thirsty and should have access to plenty of clean water at all times. Her exercise should be regular and gentle. Generally she will require no assistance at whelping and, in fact, the less she is interfered with the better. Her kennel must be clean and free from vermin, with sufficient bedding, which the bitch will arrange to suit herself. A bitch confined to a dirty kennel will often burrow underneath and make a bed for her puppies there. However, puppies lying on an earthen floor soon foul the nest, and if the spot is very dry, fleas will be very troublesome. The kennel for the bitch should be removed from other dogs, and should be thoroughly fumigated before the pups are born. To do this, place about 1lb. of sulphur in a strong tin dish and pour a few drops of methylated spirits on top of the sulphur to make it burn easily. Place the tin in the kennel, and, after having covered the kennel up well with sacking or horse covers to keep in the fumes, apply a light to the spirits and keep the kennel covered up for some hours. The kennel may then be washed thoroughly with a strong solution of kerosene and water, or, if preferred, disinfectant. When it is dry it should be whitewashed.

New-born Puppies

It sometimes happens that one or two of the puppies in a litter are born weaklings. It is usually better to destroy them, but if they are particularly valued, a little attention will sometimes get them sucking and they may improve. When a weakly pup starts sucking it is usually strengthened and heartened.

If she is a first-litter bitch, the nipples of the mother may be retracted and so offer no hold to the weak little tongues, which must be wrapped round the nipple firmly from below. One of the stronger pups put on to the retracted nipples may draw them out.

Some of the puppies may be born with dew claws, which are supplementary toes on the inside of the hind legs, slightly above the feet. They should be removed while the pups are on the mother, and she will keep the wounds clean. Dew claws can be easily removed with a pair of sharp scissors. Perfectly-healthy pups sometimes cause the novice some anxiety by their continual twitching. This is

a natural action and is, in fact, the way the little creatures take exercise.

The puppies' eyes will open when they are 8 to 10 days old. Care should be taken, especially with a first-litter bitch, that more pups than she can comfortably rear are not left on the bitch. It is better to have four or five pups well cared for than seven or eight half starved. If the bitch pups are not wanted for breeding, they can be desexed or spayed by a veterinary surgeon, after which they will never come "in season" or breed. The kennel, bitch, and pups should be kept as free as possible from fleas, and should be dusted over frequently with insect powder or sulphur.

WEANING, FEEDING, AND REARING

The disposition of the mother largely decides how soon the pups will be taught to feed themselves. If they show no inclination to feed, wait until age and hunger prompt them. It is safe to conclude that as soon as they really need food other than mother's milk they will try to get it. Start the pups feeding as soon as the mother's milk begins to fail. Make the weaning gradual, however, and never give at one meal food sufficient to swell the stomach. Feed little and often and feed each pup separately if possible. If a litter is fed together, the stronger pup will gorge at the expense of the weaker. Large masses of sloppy food gobbled in hunger will distend the stomach and ferment there, resulting in diarrhoea. Blown out with liquid or semi-liquid food they cannot possibly digest, the pups soon become anaemic and susceptible to worms.

A varied diet of plain, warm milk with a little cream added (for bitch's milk is about three times as rich as cow's milk), scraps from the table, a chop bone now and again, bread and milk, porridge and milk, and a little meat will build healthy youngsters. Care should be taken that they do not get too much of any one food. If the pups become constipated, a little cod liver oil or sweet oil in the milk should be sufficient laxative. On the other hand, if they suffer diarrhoea, the pups should be given oven-browned flour mixed with milk to the consistency of porridge. Properly-fed pups seldom have any illness, and it is not wise to give them medicine unless one is satisfied they really require it.

Use of Foster Mother

Use can be made of a foster mother if the breeder is prepared to watch the bitch carefully for a day or two. As a rule there is not much difficulty in getting the mother to adopt the new family. A wise course to follow is to remove both litters and keep them together for several hours. In the meantime the breasts of the foster

REARING A SHEEP DOG



Accustoming the puppy to the stick and cord.

mother will fill up and cause her some discomfort, and as a result she will take the strangers more readily. Another good plan is to smear the pups to be adopted with some of the foster mother's milk. If all goes well the first day, no anxiety need be felt afterward.

Rearing by Hand

Rearing pups by hand is a very difficult job, but it can be done if one is prepared to give the pups close attention. The advice of a veterinarian should be sought, as it is necessary while the pups are very young to feed them a few drops of specially-prepared milk every hour or so.

Pups reared by hand become used to man-handling, but pups reared on the mother require man-handling as soon as they are weaned. In fact, as soon as the mother begins to tire of them they will transfer their affection to man if properly fondled and fed. To prevent their growing up shy they should be taken about as much as possible and accustomed to unfamiliar objects. It is far better to prevent shyness than to have to overcome it afterward. It is well known that the intelligence of a pup brought up in the house is generally far superior to that of one reared outside. However, as most housewives have a strong prejudice against allowing dogs in the house, the practice of rearing pups indoors is not common in New Zealand.

SELECTION

There is a well-known saying that "a good horse cannot be a bad colour," and this is equally true of sheep dogs. Nevertheless, most people like a dog

of pleasing colour and type. Appearance, colour, and size are largely a matter of individual taste. The size of a puppy at birth is no criterion of its subsequent size. A weakly pup may reasonably be expected to be small when grown up; on the other hand, the smallest pup in a litter may make the most compact dog. For work, however, it is absolutely necessary that the puppy should come from ancestors noted for their working qualities, regardless of colour, shape, and size.

To stand continuous work the dog must have a good set of legs and feet. The feet should be small, with the toes close together. The toe-nails should touch the ground, giving the dog the appearance of standing on his toes. A splay-footed dog (one with big feet and toes well spread apart) appears to carry his weight on the back pads or heels of the feet. A foot of this type is generally weak, and on danthonia country the dog will suffer considerably with grass between the toes.

Importance of Eyes

The eyes, which should be set well apart, are of considerable importance to some men, and in selecting a dog one with a light eye is often condemned. Dark eyes are indeed more attractive than light, but oculists consider that the light eye is stronger and more permanently useful.

In the choice of coat the popular fancy seems to be the smooth-coated dog. In rough country where biddi-bidi abounds the smooth-coated dog is less likely to be bothered than the

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beardy and rough-coated dog, which often has to be shorn in the summer months.

Selection also depends largely on the class of country and work for which the dog is to be used. For straight-out "heading" work a "strong-eyed" pup from a good strain of fast, silent, and free-running "heading" dogs should be selected. For "all-round" and "huntaway" work a puppy from a good strain bred for this work will prove the most suitable.

A shepherd requiring a team of dogs should have at least one of each class, and if a team of four dogs is required, he should have one "header" that will lead, one "all-round" dog, and two "huntaway." The shepherd himself will know the class of country he is working on, and will select a pup to suit.

With large farms and stations fast being subdivided and the number of small farmers increasing each year, there is no longer the dog work there used to be and the demand today seems to be for a two-dog team or a single dog. For this purpose one "header" and one "huntaway" or an "all-round" dog are required, and for the man who has work for only one dog a good "all-round" dog would be the most suitable. If there is sufficient work for two dogs, a good "header" and a good "huntaway" are preferable to one "all-round" dog.

TRAINING

In the writer's booklet, "Lessons on Training," printed in 1943, the chairman of the North Island Sheep Dog Trial Association, who wrote the introduction, stated that the three outstanding features of training were "the disciplining of oneself, the careful handling of sheep, and the thorough training of the dog."

Disciplining Oneself

If the qualities inherent in the sheep dog are to be developed to the full, a thorough control of one's temper, great patience and perseverance, and a firm determination to succeed are required at all times. The man who takes pains and gains the affection of his dog will patiently persevere step by step in controlling the dog's will. Kindness is absolutely necessary, and severity, even if displayed only once, throws the pupil back, and if repeated, spoils him altogether. Some dogs may be made to do moderate work by fear, but such dogs simply work like slaves and can never be depended on. A passionate man who gives his dog a hit in anger or throws a stick at him would admit he was wrong if he were to take himself to task for it ten minutes later.

A sheep dog cannot be trained in a few days, and an owner with

insufficient time to train a dog thoroughly should not attempt the job. Furthermore, dogs that are not tended and fed properly are not likely to be a credit to an owner in appearance or performance.

Careful Handling of Sheep

Most farmers realise the importance of handling sheep carefully. To do this a knowledge of the nature of sheep and a realisation of the harm that can be done by a badly-trained dog are required. Freezing works buyers say that thousands of pounds are being lost to farmers annually through careless handling of fat stock and by rough dog work. It is the height of folly to dog the "tail" end of a mob of sheep with about six dogs, some of whom are confirmed biters. No amount of dogging or biting will shift the "tail" if the "head" is not drawing away. The same applies to work in the yards and loading into trucks and motor lorries. There is no need for six or more dogs to make the deafening noise so frequently heard in some sheepyards. By easing the "head" instead of forcing the "tail" an experienced man with a piece of sacking and a good "backing" dog can get better results in half the time. Sheep are nervous animals and are easily worked by well-trained dogs, but when handled by a rash and badly-trained dog they can be very stubborn.

A good knowledge of sheep is especially required in working ewes and lambs. The inexperienced shepherd will soon find himself in difficulties with them, and when he gets them together he will have them so mis-mothered that it will be hard work shifting them, with the risk always of a bad "break."

Sheep that "knock-up" through weakness or too fast a pace cannot be hurried, but should be left to "draw" along at their own pace. Harsh dogging will never shift them, and biting can never accomplish what gentle persuasion has failed to do. In the early morning sheep can be shifted three times as fast as they will travel in the heat of the day, and a good drover will make the most of the cool period and rest his sheep during the heat.

Thorough Training of Dog

A well-bred pup, especially one of a "heading" strain, has natural instincts that urge him to chase sheep about, and sometimes with scarcely any education at all he gets a rough idea of "heading" and "pulling" (bringing sheep to his master). More often he prefers to "ring" them (run round and round them), and from that he advances a stage further and starts

"worrying." It is not an uncommon sight to see a man trying to work sheep with a dog to which he has given no training at all. To any observer who comments on the dog's behaviour he will invariably remark: "The dog is no good." This, of course, is quite correct, but it is safe to say that as a shepherd the man is no good either, for a good shepherd always has good dogs. In many cases the fault lies in the man, not in the dog. On the other hand an experienced shepherd and trainer with first-class, obedient dogs can handle sheep without exhausting himself, his dogs, or his sheep.

The cleverly-trained dog is no freak of nature. As an intelligent puppy he was trained to become obedient to his master's commands, and by guidance developed that understanding of the handling of sheep that makes his work pleasing. There is a feeling of pride, satisfaction, and confidence in working a dog that can be completely controlled under any conditions. Some may term such a dog a mechanical worker, but when working under the control of a trainer who has expert knowledge of sheep he is a perfect example of sound sheep dog training.

Fundamentals of Training

Training should proceed only as fast as the pupil's progress will allow. Some pups are quicker to learn than others, as much depends on disposition and intelligence. The most interesting point in the training of dogs is that no two are alike. Each requires individual study, and subsequent handling may have to be varied for each case. The secret of good training is the ability of the trainer to adapt his handling methods to the individual needs of each animal.

Lessons should be carried out in private, for the presence of other animals will be sure to distract the dog's attention and upset him. Never give an order without being in a position to enforce obedience. Emphasise orders by motions of the hand or stick, and when each turn is accomplished show approval by patting the dog. Orders and lessons should be as short and as few as necessary.

Faults must be corrected early and not allowed to develop into habits. Rashness and impetuosity have to be checked, but not harshly, for they are merely an excess of zeal. Do not shout commands, but regulate the volume of voice or whistle to suit the distance the dog is away. It must be remembered that nothing but frequent tuition under the same master for two years is likely to produce a dog that can be handled with some degree of certainty, as the dog's brain, like that of human beings, is slow in reaching maturity.

Although each class of sheep dog requires its own specialised training in the advanced stage, the elementary lessons before work with sheep is commenced are the same for all classes.

Elementary Stages of Training

Training should commence when the dog is very young. Most puppies can be thoroughly trained and always controlled by kindness, as no other animal is endowed with a nature so affectionate, honest, and loyal. With these qualities, the desire to please can never be found wanting. Pups acquire powers of discernment at an early age, and, if with their masters a good deal, are soon able to detect changes of humour by the voice. They are then as easily influenced as a child, and when they do wrong a mild scolding or tap with the hand will usually be sufficient chastisement. The best way to gain a dog's confidence is by feeding him attentively, and it is an excellent plan to assist the elementary lessons with meals which come after by way of reward.

The first step is to teach the pup to answer to his name or whistle call. It is astonishing how soon he gets to know it if he is called at meal times. Some men prefer a whistle command and others use a word command, but whichever way commands are given the method adopted at the outset of training should be used always.

When the trainer is satisfied that the pup understands that the call command means food, the distance the pup is called to the feed dish can be increased gradually, until finally the pup will answer to the call without the use of the dish at all. It is always well to reward a young pup with a little tit-bit when he obeys commands.

Next, the pup has to be accustomed to wearing a collar and being secured to some object with a light cord or chain. Do not allow him to fight against this; if he does, it will only make him frightened. Never keep a young dog tied up on the chain for long periods, as a growing pup requires plenty of exercise free from restraint. When he understands that he cannot get away from the chain or cord he can be taught to be led about and to "keep in behind." If the pup is inclined to be shy, be careful not to overdo this lesson.

The education of the pup proceeds on similar lines to that of a child. Simple, but by no means unimportant lessons, given close at hand, are taught first. Gradually the lessons become harder until the pup's natural instincts are fully developed by the trainer and in time a trained dog is produced.

"Stop" Command

Having been taught to answer to his name, accustomed to his collar and chain, and taught to be led, he is now ready to commence lessons a little

TEACHING THE "STOP" COMMAND



Teaching the puppy to sit, an early lesson in the "stop" command.

more advanced. His next lesson is to learn to "stop," that is, to "stand," "sit down," or "clap" (go right down on his belly). Of all the commands that a sheep dog has to learn and obey instantly this is the most important. There are different attitudes a dog may adopt when being taught to obey this command. The calm-tempered, unexcitable pup may be allowed to remain "standing," but the rash, excitable dog is better forced to "sit" or "clap." It is preferable to make a young dog "clap" during the early stages of training. Later, if the trainer prefers, the pup can be allowed to "stand."

The pup is taught to "clap" by means of a light but strong cord with a small snap-hook at one end, which is attached to his collar. The trainer stands firmly on the cord close up to the dog to prevent his moving and gently presses him down with the hand, giving the command "Down, Jock" or a whistle command if preferred. The command need not be given loudly; dogs are keen of hearing and little more than a whisper is necessary close at hand. This lesson should be continued until the pup understands what is required of him. When he obeys without a hand put on him, move a step or two away and repeat the procedure, extending the distance each day. At the first sign of disobedience step up on the cord, and with a stern rebuke force him down. A reward for prompt obedience is helpful. A lesson like this cannot be taught in a day; it may take a week

or a month, but however long, do not pass on to the next lesson until the "clap" is thoroughly mastered by the pupil.

The pup should now be taught to remain "down" while the trainer moves some distance away. Drive a walking stick into the ground and tie the cord to it. Command the dog to "go down" and move about him or carry on with another job, watching all the time for any movement. If he moves, the pup must be put back on the same spot as he moved from, and given a little slap and the command "Down, Jock." As the pupil becomes proficient in this the trainer can go out of sight for a few minutes, but these lessons should not be overdone and the pup expected to remain "down" too long. In handling sheep all work depends on the trainer's ability to "stop" a dog immediately, so the importance of this lesson cannot be over-emphasised.

In actual working conditions today the dog will usually go "down" "head on" to his sheep when the "stop" command is given. This means that a "huntaway," for example, will often "stop," "tail on," or "side on" to his master and the "heading" dog, too, may at times go "down" "side on." While working sheep a dog should not take his eyes off them when commanded to "stop," but should go "down" immediately, whether on the head wing or below, at any angle necessary to remain "head on" to his sheep. This is, however, a very fine point and need not be stressed unduly.

Facts for Farmers about HYDATIDS

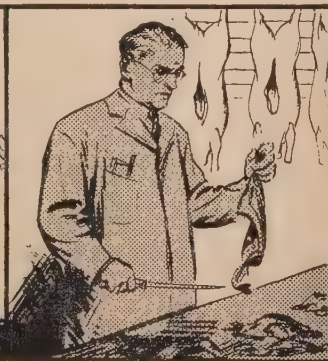
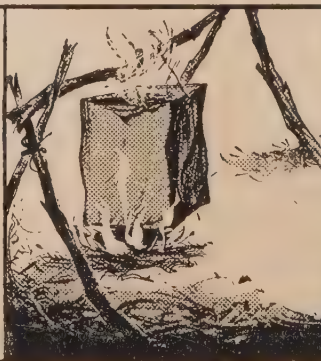
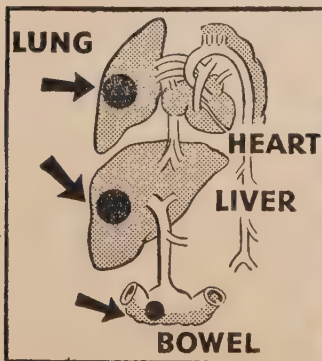


Your faithful friend cannot help being a danger to you and yours if you feed him on raw offal, and neglect to dose him for worms.



In some districts up to 70 per cent of older sheep are infected; cattle and pigs also. The hydatid cysts (fluid bladders) form usually in liver and lungs. Dogs fed on offal are liable to become infected.

Dogs act as carriers. They do not have cysts but carry the worms, whose eggs are distributed in droppings. This dries and crumbles into dust which is easily picked up on coats of animals.



Hydatid eggs get into human body from hands that have touched animal coats, or food polluted with dust. Bloodstream takes eggs to liver, lungs, etc., where they may lodge and grow into large cysts.

Never throw raw offal to dogs. Cut into slices and boil for 10 minutes first, otherwise burn or bury. Children, and all who handle animals, should never put hand to mouth without washing.

N.Z. is losing about £150,000 a year through meat liver rejected because of infection. Stock infect dogs, but dogs reinfect stock. Take precautions. Above all, use arecoline tablets to dose your dogs.

Dose your dogs regularly

Never feed them on raw offal

H2

Check Cord

Care has to be exercised in the use of the check cord. It must be looked upon, and used, as a means of preventing escape rather than a means of dragging the dog about. Endeavour must be made to keep the dog in a cheerful frame of mind while the check cord is on him. Tit-bits by way of reward when commands are obeyed will assist to do this. Any injudicious use of the cord will only make the pup frightened and sulky, and for that reason some pups are better taught without the aid of the cord. Its use should not be continued longer than is absolutely necessary to teach him what he is required to learn; but do not hesitate at any time to put the cord on him if he appears to require a little stern reminder to obey instantly.

Stick Commands

In addition to the word or whistle command, signs made with the arm or a stick lead to a better understanding between man and dog. For example, if a stick is held high and moved sharply downward as though pressing something down, the dog learns to associate the movement with the "down" command. In the same way, if the stick is swung out sharply when the dog is standing close to the trainer's side before being "cast out," it will tend to push him out, especially if the trainer moves a pace or two in carrying out the movement. This swinging of the stick left to right will soon be understood by the dog as a command to "keep out" on his cast when well away should the word or whistle commands be inaudible.

As a means of punishment the stick should be used very sparingly; thrashing is justified only after acts of wilful disobedience. Anger should never be allowed to control the stick, but if a dog has to be punished, both the trainer and the dog should know why chastisement is necessary.

Further Elementary Lessons

The pup next has to learn to move to the right and left and forward and backward on command. (Moving backward is an unnatural movement for a dog, but there are times when it is useful in handling sheep; it is therefore a matter for the trainer to decide whether his dog needs to learn the movement.) As in the lessons he has already received, the pup is put on the cord to learn these movements. The cord should be short for a beginning and gradually lengthened as he becomes proficient. One end of the cord is fastened to the collar and the other is tied to the end of a walking stick. On commanding him to "sit down," hold the stick at arm's length, first to the right and then to the left. Moving in the direction to which the stick is pointing,

command him to "Come out here, Jock," and he must, if he will answer to the pull of the cord, move out with you. To bring him forward pull gently forward, using a different command, such as "Walk up, Jock." To move him backward push backward and at the same time gently step on his toes to compel him to step backward, using another command, such as "Get back, Jock."

Whatever command is used take care to use that same command always, keeping in mind that a puppy works by habit and answers to commands through habit. If he gets in the habit of answering commands in a slovenly manner, he will never do his turns properly, but if the trainer insists on the lessons being done smartly from the start, the pup will get in the habit of obeying promptly and correctly.

There may be days when neither the trainer nor pup seems inclined for lessons; in that case give lessons a spell for a day or two. Carry on a little each day if possible, until the puppy knows exactly what is required of him by the different commands, lengthening the cord as he becomes more proficient. Repeat the lessons all over again without the cord tied to the stick, but with one end within easy reach, and finally without the cord at all, but do not be in too great a hurry to do this.

All these lessons are taught away from sheep, and are not very exciting lessons for a young dog. It is therefore necessary to keep him as cheerful as possible by patting and coaxing him. Do not try to cram the lessons; they should be as short and as pleasant as possible.

When the pup has been thoroughly trained in the elementary lessons he

... ELEMENTARY TRAINING

can be given his first lessons on working sheep. Those who breed dogs should know from the breeding for what class of work the puppy is most suitable, whether straight-out "heading," "huntaway," or "all-round" work. If of a "heading" strain, the pup on his first introduction to sheep may shape well. If that is so, all that is necessary is to control him and endeavour to encourage him to do his moves correctly, but his education must proceed step by step and on no account must he be allowed to do difficult turns. Neither is it advisable when the pup begins to work sheep to attempt to show him off to friends by asking him to do something which he may not be able to complete satisfactorily.

Although some pups will make faster progress in their training than others, generally from 6 to 8 months of age is early enough to start the pup on sheep, but it largely depends on the class of work for which he is being trained. If it is for straight-out "heading," he must be old enough to have developed a fair turn of speed before being asked to handle sheep, but a "huntaway" pup may be ready to start on sheep earlier.

Strict Obedience

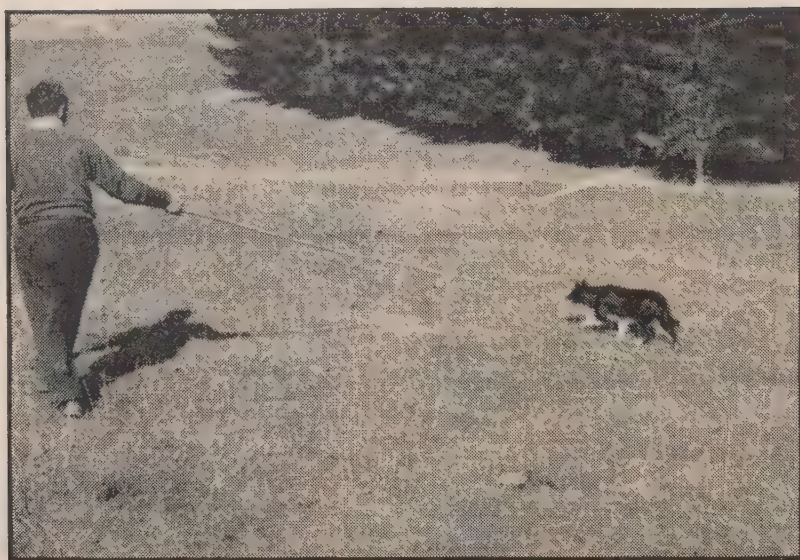
At this stage it may be well to repeat some of the very important matters in connection with the training of the puppy. Strict obedience to commands is the chief essential to good training, and if this cannot be obtained, there is something wrong. It should not be necessary to repeat a command, and it is a bad practice to do so. Instant obedience must be insisted upon. If the pup's early training has not been thorough, he will never make a first-class dog.

If one of the slower sort is being handled, too much must not be ex-



"Clapping."

TRAINING OF A SHEEP DOG



Young dog being taught to "keep out" by use of the stick.

pected too soon. Over-instruction or any attempt to force the pace will result in failure.

Another very important point is to make the sound of command suit the distance; if a dog is working close at hand, commands should be given in a quiet tone, and the volume increased according to the distance out. The commands should be short and distinct.

All lessons must be taken seriously both by the trainer and pupil. The pup must not be allowed to jump about and become over-excited. A young dog that has been unchained or liberated immediately before work starts cannot be expected to take commands at once, as he will be too excited. He should be allowed a few minutes to run about and calm down before any work is asked of him. Endeavour to keep the pup in a happy frame of mind right throughout the training. Most dogs delight in work, and can show their desire to do what they are commanded if they can be taught clearly to understand their master's desires. The objects of training are to strengthen the weaknesses in a dog's work and to eradicate bad faults, which should be checked as soon as they appear.

If a really brainy puppy is being trained, it will soon be noticed how he seems to anticipate the movements of his sheep, and will most likely be in the right position to check without commands any faulty moves on the part of the sheep. A well-bred pup in training appears instinctively to comprehend the desires and wishes of his master. If the trainer does not understand the nature of sheep, and the pupil is not particularly brilliant, the

result will be much unnecessary running both on the part of the dog and the sheep, thus defeating the objects of training, which are to teach the dog to handle sheep in a careful manner and not unduly race them about.

Introduction to Sheep

The introduction of a puppy to sheep should be done in a secure paddock where the sheep can be easily controlled. A few tractable sheep up against a fence is preferable, with an old dog at hand to take control if necessary. It should be noted that sheep that have been skilfully handled by good dogs become very tractable, while those that have been handled by bad dogs are often quite unmanageable; they do not draw together in the natural way, but divide into groups, rush in different directions, and then "bail up" and refuse to move.

For a start move the sheep about and watch the pup closely. When opportunity offers order him "down" and give him the other commands he has been taught and understands. If possible, avoid letting him rush about and become excited.

"Heading"

In the pup's first attempt at "heading" make sure that conditions are favourable. The sheep should be placed so that they cannot bolt away. The pup should have a fair chance of getting round on the "head" and should be able to "stop" on the "head" for a few moments before being asked to "come on." This is an interesting stage in the training, as the trainer can see whether his work has been successful or not. The puppy may

make a natural cast round his sheep at once, in which case the trainer may well be pleased, as it is now necessary only to "stop" him or "stand" him on the "head." On the other hand the puppy may not be so keen and it may be necessary to coax him to take an interest in sheep, in which case he should be allowed to watch an old dog doing the job. If necessary, he should be allowed to run with an old dog until he becomes interested, but care should be taken in doing so not to let the pup develop the habit of running with another dog.

It is not wise to try to force the pup to approach the sheep unless the sheep appear to be free moving. He should be allowed time to start running. Young dogs have been known to refuse to leave a trainer's heel until nearly 2 years of age, when they suddenly make a start, and later they develop into good dogs. These, of course, are the exceptions to the rule.

Very much will depend on the way the puppy makes his first shape on sheep. If he is a natural "heading" dog, he may make a nice cast round his sheep, and if a "strong-eyed" "clapping" dog he may stop and "clap" when round on the head of his sheep without a command to do so. On the other hand he may not make a promising first shape. He may run practically straight at his sheep, and may be rash and excitable, in which case it will be necessary to use some patience, first, to get him to understand that he must make a sufficiently wide cast round his sheep, and, secondly, that he must work them steadily. To do this go round the sheep once or twice with the pup on the cord and endeavour to get him subdued, keeping him out from his sheep as he goes out with the cord attached to the end of a stick.

If a young dog is allowed to get beyond control and dashes in on his sheep and scatters them badly, he is likely to develop a vice that can never be cured. When an experienced shepherd sees a young dog drawing himself together for a furious rush at his sheep he at once commands him to "drop," and so prevents any chance of the dog developing the vice.

Never check the dog on the run-out unless absolutely necessary; he should be encouraged to get to the "head" quickly. If the pupil is of good parentage and not inclined to be contrary, all that will be necessary will be to see that conditions are favourable for his first run and that the sheep are suitable for a young dog to work.

"Lifting"

After "heading," the pup should be commanded to remain stationary for a minute or two before being asked to "come on" his sheep, providing, of course, conditions are favourable. This pause is called "lifting," and is very

important. It gives the dog a short breathing space to get himself settled, especially after a long run, and also gives him and the sheep a few moments to study each other.

The first "head" a dog makes in training should be a very short one, but it is necessary right from the start to make him "lift" carefully so that when he is asked to "head" at a longer distance he can be commanded to "stop" and be relied on to "lift" well. This means that after "heading" and getting control he will approach on the correct angle and start the sheep home very gently, or, to use a shepherding expression, he will start the "pull." The secret of a good "pull" is a steady "lift," for it is in the manner of "lifting" that a dog gets on good terms with his sheep. For good "pulling" the sheep must be carefully handled at the start.

Firmness of Approach

As the dog gains experience in his work he acquires firmness of approach. To make him confident, great care must be taken to see that when he is asked to "come on" the sheep he is working they can and will move away from him as he approaches. Later he can be tried on more determined sheep, say, along a fence line, with a firm dog to "walk up" with him; then later again he can work the sheep without the second dog, but with the trainer very handy to assist, if necessary, to back the sheep and prevent immediately any attempt by the sheep to charge the dog. If a bold sheep is allowed to charge a young dog a few times, the dog develops into what is known as a "back-caster" or "tail-turner;" he becomes frightened to approach sheep and gives ground instead of standing firm. There are other methods to make a dog stand firm, but they cannot be recommended for the novice. The method described is slow and requires patience, but it is safe. In any case this is a finer point, and if the young trainer desires to perfect these points he should study an experienced shepherd handling his dogs; in this way he can soon learn the best methods to adopt.

"Pulling"

Some young "heading" dogs have a natural style of "pulling" with a snake-like movement which keeps them moving straight toward their sheep. This type of dog requires little training in this section of the work. On the other hand the pup may be over-keen, with a strong tendency to "over-run" his sheep (coming too far down on the "wing" or side of the sheep, causing them to "wear" right and left) or "ring" them (run in circles round them). These tendencies must be checked. To do this the young dog should not be allowed to "head" any distance, and if the trainer acts as "leader," he is in a

position to send the dog back the moment he tends to come round on the "wing." This can be done along a fence line, in a lane, or out in an open paddock. A perfect "pulling" dog comes straight on behind his sheep, anticipating movements and correcting any deviations from the straight "line of pull" unless commanded otherwise.

When the dog is "casting out," "heading," "lifting," and "pulling" correctly, the distance at which he works should be extended gradually. The moment any unsatisfactory work is detected bring the work closer to hand, where errors can be corrected more easily. As the dog gains experience in "heading" and "pulling" he may be sent out after sheep in more difficult country. He can be sent out after sheep that are out of sight, but for a start great care should be taken that his sheep will be easily seen as he gets on the high ground and that there are no difficulties in the "line of pull." Never intentionally send a young dog out of sight where he may fail to find sheep.

A straight "pull" is not always desirable; in everyday work a dog often has to "pull" round obstacles. After "heading" he may be required to take his sheep a distance to the right or left. If he gets them in a position on a hill where they cannot move further in the direction in which they were travelling, he may have to come right under them and drive them uphill and then down another track. Before a "heading" dog can be called thoroughly trained he must be able to take sheep in any direction. In his elementary training he should have been taught to move right, left, forward, and, if necessary, backward. When he has been taught to carry out these movements with sheep he should, on command, come "out" or "under,"

... TRAINING OF A SHEEP DOG

"walk up," and shift them in any direction commanded.

These are some of the final lessons to be taught a "heading" dog. It is not advisable to give a young, partly-trained dog too much of this work, as it may make him a careless "puller."

The chief qualities required in a "heading" dog are free running, safe "heading," and a "pull" that shows he has thorough control of his sheep from start to finish. These qualities should develop if the dog is of a good working strain and is given sound schooling.

"Leading"

Drovers have more work for the "leading" dog than perhaps shepherds, but in paddock work a "leader" may be very useful. Some dogs seem to have a natural aptitude for "leading" sheep, but, untrained, they are simply "run-ahead" dogs and are useless for holding up a mob. Almost any "heading" dog can be taught to "lead," but he should learn all other "heading" lessons first, and he must obey the commands to "come on," "keep off," and "come in behind."

Like all other first lessons, "leading" lessons must be simple and given close at hand, where the trainer is in a position to enforce obedience. Start with a few sheep, preferably in a fenced-in lane. Get the dog on the "head" and with the command "Keep off, Jock" or, better still, a whistle command try to force the sheep toward him, and he should give way. Any attempt on the part of the dog to leave the "lead" must be checked, and as he gets used to keeping ahead and is actually leading, the size of the mob can be increased until eventually he is quite at ease leading a mob of 1000 sheep, perhaps for hours out of sight of his master.

Whistle commands are best suited to a "leader," as he is often a long dis-



A "strong-eyed" dog showing concentration.

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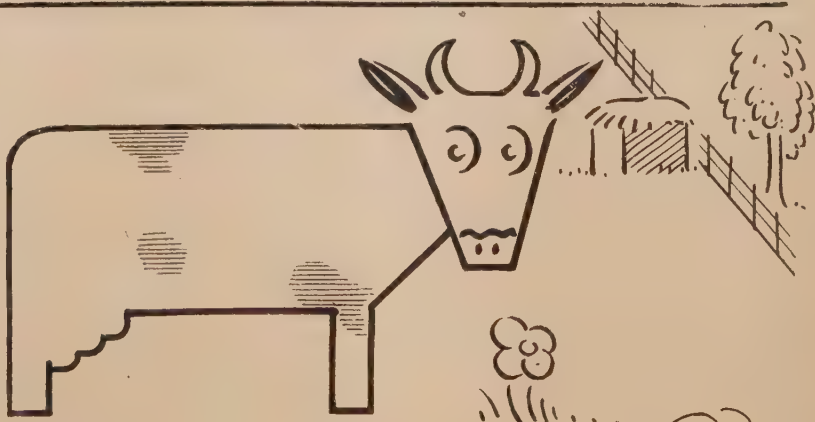
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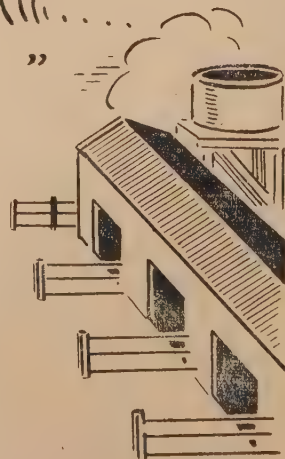


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TRAINING OF A SHEEP DOG



Left—Prevent “cutting in” too close with a young dog. Right—“Keep off” near at hand.

tance away from his master. A shrill whistle is much more penetrating than a word command and is easier on the man.

Correcting the style of slack “leaders” is difficult. It can sometimes be remedied by constant “leading” or some yard work if the dog can be induced to “force.” He should be given frequent commands to “come on” and not allowed to do much “leading” on free sheep. It is not usually advisable to allow a “heading” or “leading” dog in the yard, especially the “strong-eyed” dog, which should be used almost exclusively for straight-out “heading” work. Other “leaders” are inclined to hold the mob too tight, but this is not a serious fault and can be easily remedied by letting the dog lead small mobs while the trainer gives him the “keep off” whistle, followed up, if necessary, with a stone or two; a catapult is good for this purpose.

Difficulty may be found in getting a dog that is keen on “leading” to leave the “head” and “come in behind” when commanded. If he is driven off the “lead” once or twice, he will soon learn to understand that the “come in” command has to be obeyed.

These difficulties will not arise, however, if the training in “leading” is not attempted until the dog has had a thorough grounding in all other lessons of a “heading” dog.

“Huntaway”

The “huntaway” dog in New Zealand is generally bred from direct outcrosses. Unlike the “heading” breeds, there are very few reliable “huntaway” strains, and the breeding is somewhat haphazard. Selecting competition winners to breed from without considering ancestral qualities is no more likely to be successful than breeding from a good station “huntaway” that has never seen a trial ground.

Until some reliable strains are built up breeding results must be disappointing. No matter how well bred the pup is claimed to be, until he actually starts working on sheep there can be no guarantee that he will be entirely suitable for first-class “huntaway” work. Dogs do not naturally “hunt” sheep away direct, and, therefore, in training the difficulty is to keep the pup steady, especially in “hunting” uphill.

As a rule the class of dog chosen for “huntaway” work is more heavily built than the “heading” dog. He is not so active and is slower in his movements. He should be naturally noisy and his style of work may be likened to a boxer; he puts in “punches” on a mob of sheep, using noise for power.

The method of training is much the same as that of the “heading” pup up to the time he is ready to handle sheep, with the exception that the “huntaway” can start working behind a mob or in the yards just as soon as he is keen to do so, providing there is no chance of his being knocked about by the sheep. His training, like that of the “heading” dog, must proceed step by step, and the elementary training is most important.

“Huntaway” pups are usually not as sensitive or as highly strung as “heading” pups, especially those of the Border strain. “Huntaways” are often harder tempered and may require sterner handling. A common fault in competitive work is the dog’s habit of looking round in expectation of commands and watching his master instead of his sheep. This can be remedied to a great extent if the trainer is careful to give commands only when the dog is “head on” to his sheep. This finer point of training will, if perfected, make a “huntaway’s” work attractive.

A good “huntaway” follows on and is forcing his sheep every yard. He works with a steady, determined

movement which, if sufficiently powerful, invariably “rocks” his sheep slightly as he forces, especially on flat ground. He barks as he runs. A dog that moves from position to position silently and barks on command is not a true “huntaway,” but such a dog is capable of doing excellent work under favourable conditions.

“Hunting-away”

As with the “heading” pup, the “huntaway’s” first work on sheep should be simple, and should preferably be given in a lane securely fenced, with sufficient sheep to cover the width. Start the sheep moving and try to get the pup barking; he should do this without being forced by repeated commands to “speak up.” Nevertheless, excessive noise is not only unnecessary but exhausting, and the sheep soon become accustomed to continual barking and take no heed of it.

If the puppy is hunting keenly he can be allowed to carry on, the trainer standing still and moving forward only when it is necessary to keep the pup on his work. A dairy farmer who has a lane running through his farm has a good opportunity of teaching a young dog to hunt by allowing him to hunt the cows to and from the milking shed. He will soon learn to “follow on” and hunt steadily. When the dog is hunting satisfactorily along the lane he can be asked to hunt sheep along a fence line slightly uphill and not too steep. As he becomes more proficient a steeper grade can be selected, and later again he can be asked to hunt out in the open, but he should not be allowed to hunt any great distance.

“Slewing”

Before the young dog is allowed to hunt far he should be taught to “slew” (to turn sheep right or left, perhaps at right angles to the line he is hunting). Select a fence line running across

TRAINING OF A SHEEP DOG



"Huntaway" working "head on" to sheep.

the face of a hill and get the dog to hunt up to the fence, then bring him out on the wing of the sheep and order him "on." He should then hunt them along the fence line. When he has gone some distance bring him down below the sheep and order him out on the other wing to hunt them back the opposite way. After this has been done satisfactorily he can be given "slewing" exercises out in the open. When the dog is on the wing be careful to see that he approaches his sheep direct with plenty of force and does not come back below the sheep before he has "slewed" them. This approach, if properly executed, is in marked contrast to the natural swinging style of the untrained dog.

When the dog can "come out" or "slew" on command and approaches steadily and determinedly with a powerful, "punching" bark he needs practice only in long-distance hunting to become a good "huntaway."

A young "huntaway" generally has too much pace and is too eager, and that is probably why this type of dog is frequently not seen at his best until approaching old age. Many successful trial "huntaways" are broken in to do other work first and are later taught to hunt as age begins to slow them up. It is debatable whether a "huntaway" should be taught to "head," but much depends on the class of country and the work the dog is likely to be called on to do.

"All-round" Worker

The "all-round" worker is probably the most useful of all sheep dogs, especially on a small farm where there is a limited amount of work and where only one dog is required. Like the "huntaway" he is bred haphazardly,

Very often he may be bred from a straight-out "heading" dog and a "huntaway." Any intelligent pup that shows "heading" tendencies when he first starts to work sheep can be trained for all-round work if he has a good bark. However, as he is expected to assimilate a good deal of "heading," "leading," and "huntaway" knowledge, he must be gifted with a particularly receptive brain and an intelligence above the ordinary.

Owing to his having to learn such a variety of work the all-round dog as a rule does not become very expert at any one particular branch and is often called a jack-of-all-trades and master of none; nevertheless, he is often called upon to do more work than any other dog, whether as one of a team or alone. His training proceeds on the same lines as the "header," "leader," and "huntaway," but it is advisable to make a good "header" of him first and the other work can be taught afterward. Endeavour to keep his work balanced and find a good variety of work for him. Thorough control is most essential in handling this class of worker, especially if he has a leaning more to "heading" than "huntaway" or vice versa.

"Backing" and Yard Dog

A naturally-noisy dog like a "huntaway" or all-round dog can be taught to "back" sheep. Some require little urging; others have to be coaxed. A young dog must be protected from being charged by sheep or sheep being forced over the top of him.

Get the crush pen tightly packed with sheep and gently lift the dog on to their backs, being careful that there is no risk of his falling through to the ground. Endeavour to get him

feeling at ease and induce him to move about on the sheep's backs "speaking up." As he gains confidence he can be ordered to move up to the mouth of the race, where the sheep will not be so tightly packed, and he will be able to get down on to the ground. He should then be encouraged to move back through the sheep, which will move past him. In this way the mob will be tightened up, or if the race gate is open, the sheep will start drawing through. In the early stages of these lessons the dog, if he finds himself slipping off the sheep's backs, has a tendency to leap out of the pen. This can be prevented in either of two ways; first, by attaching a cord to him, and, secondly, by having two assistants, one on either side of the pen, to keep the dog in the pen and make him understand that he is required to get down among the sheep and move back.

When dogs become used to this work they delight in it and are extremely useful not only in the yards, but in railway trucks and motor lorries. Care has to be taken when the young dog is moving back through the sheep that they do not tread on his toes. Later as he gets used to the job he will look after his toes himself.

"Cutting Out" or "Shedding"

Fat lamb farmers with small farms, especially those in the Waikato, have adopted the "cutting out" or "shedding" method in handling their ewes and lambs. Newly-lambed ewes are left undisturbed for about a week after lambing and are then carefully "cut out" of the mob and quietly put in another paddock with their lambs. In some cases these "cuts" are docked as they are brought out, the crook of a walking stick being useful for catching the lambs. In this way no docking yard is required, there is no mis-mothering, and the docking ground is clean. A mob of nearly 1200 has been lambled down and docked in this manner.

Another important operation common on these farms is "cutting out" the ewes whose lambs have gone away fat and the empty ewes from those ewes that are still suckling their lambs.

The dog best suited for this work is the silent "heading" dog with some "eye" and concentration power, but this lesson, like "leading," should not be taught until the dog has completed the greater part of his ordinary training. Dogs can become fond of "shedding," and if given too much, are apt to lose the desire to "gather;" they will tend to concentrate on a few sheep and ignore the others.

A walking stick or longer stick is of considerable help to the trainer in teaching a dog to "shed." The dog should be made to bring six or eight sheep as close as possible to the

trainer, who has to separate them into two lots, using the stick. Command the dog to "come in" between the separated lots, and make him "stand" or "clap." With the trainer's assistance the "cuts" are moved further apart and the job is complete. The "cuts" the dog is concentrating on can be taken in hand and driven as desired.

To enable the dog to do the job properly he must be given every assistance possible in his training for this work. Later, when he understands what he is required to do, he will come in closer to his sheep, ready to spring into the slightest gap as directed. Care must be exercised to see that the "cuts" consist of dry sheep for a start, and a dog new to the work should not be asked to handle ewes and lambs.

Cattle Dog

Although most of the cattle in New Zealand are worked by dogs trained for sheep work, a special type of dog to work only cattle may be desired. In handling cattle a dog does not have to be as exact and as gentle as in working sheep. A good "heeler" has to "heel" low down without any danger of getting hurt, and he must be able to swing round to the head of a beast and take it by the nose.

Some stations used to keep a stockman working entirely among cattle, and his dogs were specially selected. They were generally a coarse kind of sheep dog with a trace of mastiff or bulldog blood. Some Border dogs have been found good as cattle dogs. In Australia there is a dog called "The Blue Merle Cattle Heeler," which is well known as a severe "heeler."

VICES

Vices should be corrected immediately they show themselves

in a young dog, and the training should not proceed until these faults are corrected. When they have been allowed to develop, vices such as biting, "ringing," rash and close "heading," and tail turning cannot be satisfactorily corrected.

Biting Dog

Apart from other objections, the risk of one quarrelsome dog injuring another dog cannot be taken when there is much work to be done. Ferocity and good sense seldom go together. The fierce pup that "nips in" at the first opportunity and in bad cases bites hard and hangs on to his sheep is better worked on cattle. If he gets a few kicks he may be cured, but a bad sheep-biter is not worth training. Sometimes he can be checked, but he is never trustworthy. Probably the best remedy is to get the dog working in the yard or behind a mob of sheep and instead of a walking stick or switch get a piece of fencing wire; at the exact moment the dog grips the sheep bring the wire down sharply across his nose. This happens so quickly that the dog does not know where the blow came from and usually he does not attempt to bite again for some time. It is no use thrashing a dog for this vice, and deterrents such as a spur fastened in the mouth of the dog or a wire through his nose to catch in the sheep's wool are not cures; the moment they are removed the dog bites as badly as before.

Bolting

If a young dog suddenly gets beyond control and bolts off after sheep, little can be done until he returns. The trouble may be caused through over-

... TRAINING OF A SHEEP DOG

keenness, excitement, or perhaps fear, but it clearly indicates a lack of thorough elementary training. Had the dog been thoroughly grounded in the "stop" command, the moment any symptoms of excitement such as the tendency to bolt showed themselves he could have been ordered "down" or put on the cord until the excitement had subsided. When the pup acts in this way do not rebuke him, but put him at ease; watch carefully for a repetition of the fault.

Shouting angrily at a dog and menacing him with a stick are not likely to get him to "come in." A common mistake of trainers is to coax a dog within reach by saying in a mild voice, "Come in, Jock, good dog," and then to hit him. This is hardly likely to encourage him to obey the "come in" command.

Barking at Night

Unhappiness and discomfort are the usual causes of a dog barking and howling at night. Other causes are stock grazing near the kennel, the presence of a bitch "in season," and other dogs prowling about. A young dog accustomed to company is likely to howl when by himself at night, but the most frequent night howler is the chained-up, hungry dog with a cold and uncomfortable kennel. It is important, therefore, to see that a dog's kennel is made comfortable and that he gets regular feeding and exercise.

Whip Shyness

If the trainer is patient, he can cure a dog's whip shyness. For a start see that the whip is cracked some distance away from the dog, and then gradually bring it closer, suiting the



Left—Gaining confidence in learning to "back." Right—A trained dog "backing" sheep.

TRAINING OF A SHEEP DOG . . .

distance to the effect it has on him. This lesson is best given at feeding time while the dog is busy at his meal. He may shrink or cringe badly, but with a little judicious management he will probably take little notice of it after a few lessons. Be careful not to frighten the dog more than can be helped.

"Sundowner"

There is no reason for a dog that is healthy and not too fat or in soft condition to be inactive. If he is, it is simply laziness and nothing can be done about it. Such a dog will not be tolerated for long by a man who likes plenty of action.

SALIENT POINTS OF TRAINING

When a dog has completed his training the instruction that follows is comparatively simple and is suggested by the shepherd's daily duties.

The salient points to remember are:—

1. When working two or more dogs see that distinctive commands are given to each dog;
2. Do not keep more dogs than necessary;

3. Do not try to handle two or more young dogs at once, and

4. When giving commands bear in mind that immediately the voice or whistle alters, it reveals lack of self-control and thus upsets the dog.

BUYING A BROKEN-IN DOG

Some men prefer to purchase a dog already broken in, and they estimate its value by its suitability for the work required of it. Before purchasing such a dog it is always advisable to see it at work, as the seller's description of the dog's ability may not be quite accurate. It is unlikely that a prospective buyer would be permitted to work the dog before buying, as a dog in strange hands is not likely to work the same as he does for his owner or trainer. It may take months before a dog becomes thoroughly accustomed to the tone of his new master's voice or whistle commands.

A buyer should remember that a really good dog is worth a high price. If he expects to buy a broken-in dog cheaply he is going to be disappointed, or is easily pleased. Well-trained dogs are

seldom on the market at any price, but young dogs spoil in training and having bad faults are always procurable for a few pounds.

After obtaining a broken-in dog, give him time to become accustomed to his new surroundings before attempting to work him. When he has settled down and appears ready for work start him off in the same way as a young half-trained dog. He should be given work close at hand until the trainer is satisfied that the dog understands the commands.

SHEEP DOG TRIALS

Sheep dog trials are tests of efficiency. The trial grounds are not training tracks, but testing grounds and therefore are not for the inexperienced man with a half-trained or badly-trained dog.

Trials are not organised merely to provide sport. Their object is the better management of stock, and for this reason the numerous trial courses throughout New Zealand are arranged so that the tests as far as possible include all sections of everyday work. Although the scope of the average competitive trial is not sufficient for the thorough testing of the dogs, the most is made of the limited space, time, and number of sheep, and many of the best qualities of the working dog are brought into prominence. The result may be affected by luck sometimes, but usually it depends on the dog being able to keep on good terms with his sheep. A good dog nearly always beats an inferior dog, but an apparently-inferior dog may have natural instincts superior to a winner and be unsuccessful simply because he has been badly trained and handled.

In these days of high-class performances a dog must be naturally skilful and cleverly trained to be a winner. This does not mean specialised training, but thorough training in everyday work throughout the year.

Trial Clubs

Before the war there were about 130 sheep dog trial clubs in New Zealand. About 80 of these were in the North Island and 50 in the South Island. Today there are nearly 100 trial clubs in the North Island, and, in addition, the North Island Dog Trial Association issues permits for many show-ring and sports clubs events. Each year a North Island, a South Island, and a New Zealand championship are held. These field trials attract large entries, and usually 80 or more entries for each event are received, and at championship trials 120 to 130 entries in each of the "heading" events are becoming common. The prize money is substantial, from £50 to £60 or more being paid to first prize winners.

Illustrations in this article are from photographs by L. Baker, Rissington, Hawke's Bay.

D.D.T. DUSTING MACHINE



A D.D.T. dusting machine in operation on pastures at Matawhero, near Gisborne, where D.D.T. is being used to control the red-legged earth mite.

The machine carries at the rear 12 fishtail spreaders spaced along two 9ft. booms each of which can be raised or lowered separately. By raising either of the booms to an upright position it is possible to get in close to hedges and fences, so ensuring complete coverage with the dust.

The illustration above shows clearly the large area which can be covered at one sweep and the heavy cloud of dust which is discharged through the twelve fishtail spreaders. On the left of the picture can be seen the coating on an area which has been treated.

Harvesting of Grass and Clover Seed

By E. G. SMITH, *Fields Instructor, Rangiora.*

BECAUSE of the fall in small seed prices, the harvesting of grass and clover seed crops to the best advantage becomes increasingly important. With the abnormally-high prices of recent years a proportion of the seed could be lost or damaged during harvesting and the crop still be very profitable, but today such losses may prove to be the difference between a profit and a deficit on the crop.

SMALL seeds production is likely to play an important part on Canterbury mixed farms for many years. Every care should be exercised to harvest the maximum quantity of seed in first-class condition, and the reminders given in this article may prove of value to seed producers.

Whatever the crop, threshing should not be started until the material is in fit condition.

The settings and drum speeds recommended by the header manufacturers are intended only as a guide. The operator must examine straw and seed periodically to ensure that seed is not being lost or damaged.

After the harvest all straw should be removed from the paddock. If baled, this material may prove useful for stock food, but if left on the area, it harbours grass-grubs, slugs, and similar pests. Such neglect can mean the ruination of a pasture which would otherwise have been good for years.

Perennial Ryegrass

The perennial ryegrass crop is ready to cut when the top seeds shake readily or when they can be collected in a hat swept across the seed heads. Probably the most reliable method of harvesting is to reap and tie the crop with a binder and later thresh from the stook. When that system is adopted the sheaves must be handled carefully to avoid undue loss.

Canterbury is now well supplied with header harvesters, and the most popular method of harvesting is to windrow the crop with a binder and then pick it up and thresh it with the header. Unless the crop has lodged or is particularly heavy, windrowing with a binder is usually found more satisfactory than windrowing with a mower.

Perennial ryegrass must be allowed to stand until dead ripe if the crop is to be direct headed or stripped. If either of those methods of harvesting is adopted, half-filled sacks of seed should be hung on a fence and turned at regular intervals for conditioning.

Italian Ryegrass

Though Italian ryegrass may be windrowed and then picked up with a header harvester, the seed shakes readily and the safest method of harvesting is undoubtedly to cut and tie the crop with a binder before the seed becomes thoroughly ripe. The crop should be stooked while being cut, and small stooks of six sheaves are satisfactory. Small stooks allow the forking of six sheaves by two men at one operation, reducing seed loss to the minimum.

If a threshing mill is not available, the header may be used as a stationary unit or may be drawn from stook to stook. For use with a stationary header a tarpaulin fitted with a drawbar will prove an effective carrier. If stooks are carefully forked to the tarpaulin, seed losses will be negligible.

Cocksfoot

Cocksfoot is ready to cut as soon as seed will fall when the seed heads are shaken. On the Canterbury Plains the



Cocksfoot is usually cut by binder and threshed out of the stook.

common method of harvesting is to cut and tie the crop with a binder and thresh out of the stook as soon as the seed is thoroughly mature.

If the crop is stacked, threshing should be carried out as soon as practicable or mice may play havoc with the seed.

Under suitable conditions cocksfoot may be windrowed and picked up.

White Clover

The white clover crop should be cut when 80 to 90 per cent. of the seed heads are brown and the stems are yellow. If an inside divider is fitted to the mower, the swath is left in a narrow row which facilitates picking up.

To mow light crops a catcher can be fitted to the cutter bar of the mower, and the material may then be raked into rows by someone walking behind the machine.

In showery weather second growth coming through the rows may cause considerable trouble. Under such conditions an aerator may be used or the mower knife may be run under the rows a few hours before threshing is begun.

Exceptionally short crops are sometimes harvested with a chain stripper.

Red Clover

Until recent years most red clover crops were cut with a side-delivery mower and stack threshed by a clover huller, and if that method were adopted today, more profitable yields might be obtained. However, most crops are either direct headed or cut with a mower and picked up and threshed by a header harvester.

If the crop has ripened evenly, direct heading may be more satisfactory than windrowing, for the standing crop is less susceptible to damage by weather. If it is to be direct headed, the crop must be allowed to stand until it is dead ripe.

Red clover is ready to mow when 80 to 90 per cent. of the flower heads are brown and the stems are browning.

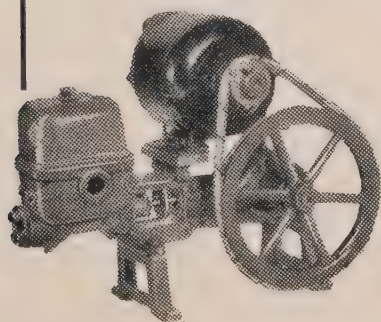
Damaging of seed during harvest frequently results in red clover samples failing to reach the requisite standard of purity. Care must be exercised to ensure that the material is in a fit condition before threshing is begun. Both seed and straw should be examined at frequent intervals throughout the day, as changes of temperatures may necessitate adjustments to the header.

If the weather is unfavourable for threshing in late autumn, the red clover crop should be stacked.



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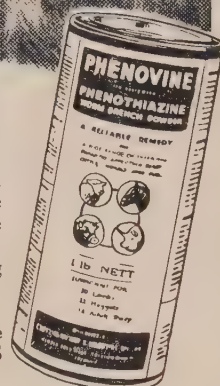
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A Survey of Rural Nelson and Marlborough

A REVIEW of population trends and the development of towns and urban centres, and an interpretation of the trade and business of the provinces, are contained in this, the second section of an article reporting the results of a survey of rural Nelson and Marlborough by F. R. Bray, who at the time was Field Economist, Rural Development Division, Wellington. The first section, discussing the scope of farming and such secondary industries as exist, the relative importance of farm and factory, and the influence on the people of their methods of livelihood, was published last month, and the concluding portion will appear next month.

OF the ten counties visited the population declined in seven between 1936 and 1945, the two Census dates, as shown in the following table:—

TABLE V: COUNTY POPULATION

County	1936	1945	Increase	Decrease
Sounds ..	1,073	946		127
Awatere ..	1,607	1,443		164
Waimea ..	12,934	11,497		1,437
Collingwood	1,517	975		542
Buller ..	6,350	4,936		1,414
Murchison ..	1,919	1,270		649
Inangahua	3,891	3,242		649
Marlborough	7,787	7,856	69	
Kaikoura	2,578	3,424	846	
Takaka ..	1,909	2,182	183	
TOTALS ..	41,655	37,771	1,098	4,982

The decrease in county population of the provinces was 3884, but within these counties, though leaving out the larger centres Blenheim, Nelson, and Westport, there are several boroughs, and when those are included in the totals the population decrease is reduced to 3271. Nevertheless, that is a very substantial decrease in nine years. In four of the counties, Buller, Inangahua, Murchison, and Collingwood, coal and gold mining and saw-

milling are important in the population picture, and they are also among the counties which have suffered the most severe population declines. The partial exhaustion of natural resources has involved a drift from those counties which is inevitable, at least until forest conservation is put on a proper footing. The closing of the coal mine at Puponga, for example, has meant a considerable loss to Collingwood, just as the completion of the rail link with Westport and the closing of Public Works Department camps has meant a loss to Buller. Sounds County is influenced by the tourist trade. Awatere and Waimea are rural counties registering a fall in population, while Marlborough, Kaikoura, and Takaka have increased, though Kaikoura is affected by the completion of the South Island rail connection and Takaka is much affected by the presence of the Golden Bay cement works and the Cobb hydro-electric scheme.

In interpreting the reductions shown in Table V the abnormality of both Census years 1936 and 1945 must be considered. The year 1936 was the first

year of final recovery after a prolonged depression. It is more than probable that numbers of workers who had sought employment on farms or gone gold prospecting because of restricted opportunities elsewhere had not yet left. On the other hand, the effect of the war was still apparent in 1945; the replacement of men who had been absorbed by the war machine meant a combing of rural districts for women workers, involving a two-fold drain on those areas.

When the movement in the population of the three towns of Blenheim, Nelson, and Westport is taken into consideration, the net loss suffered by the county and borough areas is just liquidated, as shown in Table VI.

Thus for Nelson and Marlborough as a whole the population between the last two Census dates remained practically stationary. That suggests that it might have increased a little between 1936 and 1945 but for the population drain caused by the war.

Location of Decline

Do the rural towns and townships show any marked effects of the decline in rural population? Are there numerous cases of unoccupied business premises and houses? In Waimea County the answer is definitely no. The settlements concerned are Wakefield, Brightwater, Mapua, Stoke, Tapawera, Upper Moutere, and Riwaka,

HEADING PHOTOGRAPH

Though careful plans not common to other towns visited were made for Picton's expansion, that they went astray is apparent in the lopsided development shown in this photograph by R. W. Wyber, with the business area in the upper right corner.

POPULATION OF NELSON AND MARLBOROUGH . . .

TABLE VI: PROVINCIAL POPULATION

Provincial or Urban Centres:		1936	1945	Increase	Decrease
Blenheim	..	5,036	5,780	744	
Nelson (including Takaka)	..	12,076	14,176	2,100	
Westport	..	4,241	4,686	445	
				3,289	
Other Boroughs:					
Picton	..	1,381	1,577	196	
Richmond	..	1,138	1,387	249	
Motueka	..	1,741	1,909	168	
				3,902	
County areas	..				3,884
Net gain for Nelson and Marlborough Provinces	..				18

Richmond and Motueka being boroughs. In those townships 477 houses were counted and of them, as far as could be judged, there were only two unoccupied houses worthy of the name. In the same towns three shop premises, out of a total of 24, and one blacksmith's forge were unoccupied. That is not a very high proportion, for in the prosperous borough of Motueka four shops were unoccupied out of a total of 51. Moreover, the three unoccupied shops were in two towns both now on a suburban bus route to Nelson. The general impression, sustained by such figures as are available, is that the towns of the district have not suffered any marked decline even if they have shown no great progress, except in the case of Stoke, which has 46 of the 72 houses counted as built after 1928.

The location of rural population decline must be sought elsewhere, as employment opportunities in the rural towns do not seem to have declined greatly. In any case, only about one quarter of the total population of the counties visited lives in the rural towns included as such in this survey. The proportion of persons living in towns is high (one half) in Buller, Murchison, and Inangahua, the result of the combined effects of isolation from larger centres and mining. It is noticeably below average (one fifth and one seventh) in Marlborough and Waimea Counties, which include intensive farming districts and have good access to Blenheim and Nelson. Isolation makes for a larger number of local businesses because of lack of competition from the larger centres. In the other counties the proportions range between these two extremes according to the combined effect of intensity of farming, usually making for a lower proportion in the towns because up to a point farming then becomes relatively more important than other occupations; distance from the provincial centres and boroughs, making for a high proportion; and the influence of other occupations, such as mining or sawmilling. Thus Kaikoura, a county tending toward extensive farming but having fair access to Christchurch and

Blenheim, has now a similar proportion in rural towns to Takaka, a dairy-farming district which is extremely isolated.

The assumption that the country areas rather than the small country towns have suffered greatest depopulation is confirmed by the fact that almost without exception it is the sparsely-settled counties in both islands which have shown population decreases. It seems true to say that the rural areas proper have suffered in comparison with the small townships just as the small towns have suffered in comparison with the larger. The general tendency is toward a concentration of population in the larger centres, which at the moment means to the north.

It is fairly clear that sheep districts have suffered depopulation, as has the area under grain in mixed farming districts. Some farming districts were short of labour and could not get workers at or near award rates, and with better wages and working conditions in the urban areas, and especially the 40-hour week, that shortage is likely to remain until overtaken by farm mechanisation or any further improvement in the efficiency of the present labour force.

The decline in population in Waimea County calls for further comment. A discrepancy arises from the different dates of the Census, that for 1936 being in March, at the seasonal peak of labour requirements, and that for 1945 in September, before the inflow of labour into the district. That might account for as much as 1500 people, or more than the decrease in population. The 1936 Census totals for Waimea also suggest a very great backing up of people on farms during the depression (2), so that the decline represents to some extent an adjustment because of an improving employment situation.

The decline in rural population has not had any spectacular effects on rural towns. That can be explained partly in terms of in-

(2) From 1926 to 1936 the population of Waimea County increased from 9172 to 12,506 and of Marlborough County from 7381 to 7518.

creased farming prosperity, which since 1936 has helped to maintain the economic life of the towns, and partly in terms of mechanisation, improvement in labour utilisation, and some lack of farm maintenance, which have enabled the volume of current farm output to keep up despite a diminished labour force.

All this is not to deny that important changes have occurred in the life and occupation of people in these country towns over a period of years. Mechanisation and motor transport have replaced or are replacing the blacksmith by the motor garage, with better transport the local paper has given way or lost ground to the metropolitan daily (3), and some processing of local resources by grain mills and brickworks has disappeared. But new activities have also come, in addition to motor transport, electrification, the railway, and the cinema, and contact with the outside world has been made closer.

Locations of Country Towns

A map of the towns included in the survey shows that almost invariably they are on the main through routes, though occasionally new routes have by-passed old settlements, or fertile river flats enclosed by mountains or some other physical obstacle have enticed settlements away from the highway. The township farthest off the arterial route is Tapawera, and even that is on the shortest route between Motueka and the west coast. The main activity of Tapawera is the district high school, situated there because the township is a geographical centre for the district the school serves and it is at the junction of roads going to join the west coast-Nelson route through Motupiko and Tadmor (the railway runs via Tadmor). In the main the other townships off the main road are the mining settlements of the west coast, attracted to the coal fields.

The general location of country towns is determined by the density of settlement and economic resources of the surrounding areas. In continuously-settled, extensive sheep country of the small grazing run type 20 to 30 miles may separate one township from the next; in intensive arable farming districts of the market garden and fruit-growing type the distance may be no more than three or four miles—indeed, parts of the Waimea Plains in Nelson are one continuous settlement for miles along the main road, notably the Belgrove-Foxhill-Wakefield area.

(3) The extent of the economic orbits of Christchurch and Wellington can be judged by the circulation of the newspapers of the two cities. Christchurch papers go to within 20 or 30 miles south of Blenheim and over to the west coast. Wellington papers circulate side by side with local papers in the Blenheim-Nelson hinterlands.

TOWNS OF NELSON AND MARLBOROUGH



[Neville R. Lewers photo.]

Westport, the urban centre and port for the west coast of Nelson Province. An endless stream of ships calls there for coal and timber.

Thus from a map showing only roads and townships it should be possible to conclude that the country between Renwicktown and Murchison, Wakefield and Murchison, and Ward and Kaikoura is barren or only extensively settled, because it is either mountainous (which in fact it is) or otherwise infertile. The alluvial plains of Waima and Wairau are represented by the concentration of townships near Nelson and Blenheim. How close townships may be in these circumstances is shown by the presence of three within six miles of Blenheim on the Picton-Blenheim highway and by the borough of Richmond within six miles of Nelson. Those distances may be compared with that of about 50 miles between Ward and Kaikoura in a sheep and run cattle district with but little ploughable land. Between Ward and Kaikoura there is no township worthy of inclusion in this survey but only settlements such as those at Wharanui (a church) and Clarence Bridge (a store). Those differences in accessibility of towns mean substantial variation in household arrangements and patterns of consumption.

Distances between centres do not necessarily indicate how towns would be situated with present patterns of production, consumption, and transport, transport having improved so greatly since the days of early settlement. As is obvious when considering population trends, the development of

transport has favoured the larger centres. Because of the economic growth of surrounding areas and despite better transport the smaller townships are still able to survive in districts of intensive cropping at distances which may be as little as one and a half to two miles (15 to 20 adjoining houses usually mean a township). The larger rural shopping centres such as Wakefield or Brightwater, which provide some choice of shops and entertainment, can still survive six miles apart, though usually they are more than twice that distance. Though the larger county centres providing professional and administrative services as well as a wide range of shops can in special circumstances be very close together (Richmond and Nelson), in most rural areas this distance is not likely to be less than 20 miles (Picton and Blenheim). Within the limits set by these considerations the location of each town has been decided by the presence of crossroads, water supply, dry flat land, shelter and aspect, or historically by river fords. Those remarks apply to rural towns; mining towns do not necessarily conform to those standards.

Development of Towns

Towns also have standard patterns of internal development. In the smallest centres the pattern is already determined by the layout of highways and crossroads. The general store,

post office, and hotel will be found on the main highway, tending to concentrate at the crossroads, which are nearly always present. Churches, hall, and school have a greater freedom of movement. They may or may not be on the arterial highway, depending for one thing on the vagaries of public and private land grants. They are probably better off the main road, as they are for the benefit of the local community rather than the through traveller. The houses of the township dwellers will straggle along both the main road and the crossroad from these facilities. On the fringes of the township residential dwellings will be intermingled with farm houses and small holdings until the land is given over completely to the farming typical of the district (4). From such beginnings most of New Zealand's smaller country towns have grown.

It may be because they have so often grown without any planned development, because they had to use the roads as they found them—for instance, a highway intersected by a crossroad—that the unsightly and uneconomical (5) ribbon development

(4) The towns are too small in all cases and the country surroundings too varied for them to be surrounded by belts of market gardens and milk suppliers, as envisaged by V. Thunen in "The Stationary State."

(5) Uneconomical for availability of services, but other factors, such as cheaper land or the layout of roads for the convenience of through traffic, have determined the development.

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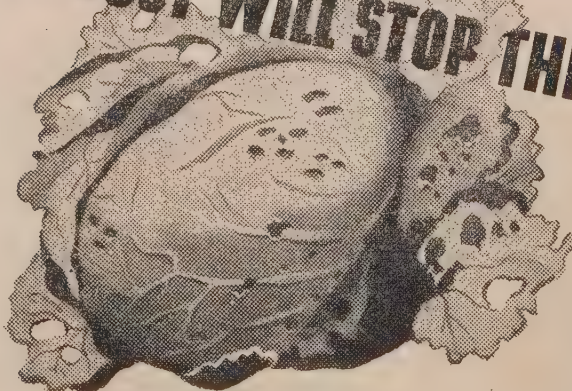
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has become such a common feature of the country districts. Towns which, because of their increasing importance later, have been planned and roaded often show signs of a more primitive layout, such as old houses appearing among what is now the shopping area, or two or more shopping areas existing, indicating that the economic centre of the town has shifted, perhaps with the advent of the railway or a change in the main traffic route, and in one case at least through the activity of a land speculator holding out for a rise in price. As the towns grow in size there is less reliance by shops and hotels on passing traffic and greater diversity of development, isolated shopping areas growing up to serve the local residents.

The most interesting exceptions to the general pattern of layout are Seddonville, Ward, and Renwicktown. Renwicktown, which was originally planned as a township—indeed, it was expected by the surveyors to become the capital of Marlborough—dates from 1854. It took its name from its founder, a follower of Edward Gibbon Wakefield, and is reputed to have been settled on New Zealand Land Company principles. As a planned township it shows distinctive features—a rectangular layout dotted with church sites and dissected with formed and partly-formed roads. The business area is concentrated along the side of the rectangle formed by the road to Nelson and the older houses and small holdings are for the most part within the rectangle, but more recent development has taken place along the main road. Seddonville and Ward are both, as their names imply, townships originating during the Liberal Ministry of 1891 to 1912 and both depart from usual standards. Seddonville is the outcome of a special settlement of small holdings, and Ward springs from the well-executed subdivision of large holdings into grazing runs, small holdings of workers' houses forming part of the township itself. In neither case has settlement proceeded sufficiently far to upset the original plan of triangular or rectangular layout.

Picton, a town of much larger proportions, is another case where early planning (and the limitations set by the encircling hills) has prevented a straggling development. In the days when the Provincial Councils performed many of the functions now carried on by the General Assembly Picton was the capital of Marlborough, and planning in roading and the layout of reserves and public buildings anticipated settlement. Picton is laid out with roads converging on a central square, but if it was intended to make this square the centre of gravity of the township, the plans have gone astray, insufficient allowance having been made for the attraction of the harbour and waterfront in this shipping and tourist centre for the Sounds.

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The clustering of shops and business premises on the main traffic route, sometimes on the outskirts of a town, clearly indicates the dependence of a town on the surrounding countryside. But as a town grows there comes a time when the local population has sufficient importance to influence the placing of shops. Therefore in straggling towns the size of Motueka, Reefton, and Kaikoura (as also in Picton, though to a less extent because of its compactness) there are the beginnings of shopping areas situated for the convenience of local residents and well away from the shopping centres. Before that stage is reached a more elaborate roading system than the highway and side road of the small township is required, and as a town graduates into the shopping centre category—that is one that has competing shops—residential roads make their appearance, suburbs in embryo. Usually, however, these roads are in addition to a ribbon development along the highways and not substitutes for it. This ribbon development tends to result not only in lessened public convenience, by increasing the distances between local residences and shops, but also in higher shopping overheads by creating a demand for additional shopping facilities which the town might be able to do without if it were more compact (6).

To obtain a layout which will serve the local community as well as the surrounding countryside and through traffic is a complicated problem. The by-passing of country towns by arterial highways; though it will certainly reduce traffic risks to local inhabitants and free the town from dependence on this incidental trade, will also mean some economic loss and a further weakening of the position of the country town, at least in the short run.

To the observer the absence of attempts in the smaller towns to weave the life of the community around any one centre combining cultural and recreational facilities is noteworthy and perhaps significant—significant because it may indicate that, with the distractions offered by books, magazines, outside daily papers, films, and the radio, residents no longer look to the local town or village as offering the facilities of the complete life. Perhaps this shifting of the centre of attention has gone too far.

Very few attempts to beautify country towns were noticed, and shade trees, lawns, or gardens on roads or reserves are noticeably absent. Lack of shelter from prevailing winds is

another feature. There seems to be a case for local planning and initiative in this respect.

The following may be of interest as comments made on the spot about a fairly-typical though somewhat better-than-average rural town with a population of between 300 and 350: "The main road is tar sealed; the shopping area boasts in addition a footpath on one side of the road. Other streets are metalled and dusty with no footpaths or kerbs and with long grass and weeds on the roadsides. There are no shade trees, lawns, or gardens on roadsides, though there is a good deal of indiscriminate planting of the inevitable pines and gums on surrounding reserves. Such plantations were being threatened in three separate cases by fires burning in the vicinity. For the greater part of the town gardens are unspectacular, somewhat untidy, and weedy (specially lawns). That applies particularly to the older places in the more central part of the town, where sections are too small for extensive planting of either shelter or ornamental shrubs. These remarks do not apply to some of the newer homes with more extensive sections. Apart from anything else, the varying nature and condition of frontages—paling fences, wire fences, hedges in varying stages of tidiness, and concrete fences, all of different shapes and sizes—make for a picture of sturdily-independent untidiness."

Types of Country Towns

At first when casually passing through the country one might be tempted to imagine that towns just happen, that they always have been where they are and always will be. That this is far from true is obvious in areas of New Zealand where gold mining or timber milling were early activities on land that was too mountainous, infertile, or remote for the later development of pastoral or agricultural pursuits. Towns have an intimate and complex relation with the surrounding countryside and with other towns of varying size, both near and far.

The significance of the smallest kind of rural township lies in its ability to distribute through general store, petrol pump, insurance agency, hotel, and post office a wide range of goods and services at short notice and provide rapid communication with the outside world. In most cases it should be sufficiently close to the people it serves for them to make day-to-day contacts or visits. It will not usually have a bakehouse or butchery, products from which are usually delivered from a larger centre. In addition to a general store, hotel, post office, and railway station, the typical town of this type

(6) Cf. the effect of density of settlement on shops per head of population in the different counties, pages 56 and 57.

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would have one or more churches, hall, and school, and in centres closely settled or using much machinery a motor repair garage or blacksmith. The school is important not only because it provides educational facilities but because, except in the case of a consolidated school, the radius from which the children come will provide a fairly-clear indication of the extent of the area served by the township, and children can be entrusted with posting mail and bringing home requirements. Similarly, the limits to the area served by the local church or hall are set by the possibilities of convenient travel and return. By having clergymen divide their attention among several settlements it is possible to have at least one place of worship in almost every township.

The factor determining the area which the town and church serve is transport—its speed, cost, and comfort. In most cases both the location of the town and the presence of a church will have been determined by transport conditions in the past, when motive power was the horse and roads displayed marked deviations in surface as well as in direction. Nevertheless, the active functioning of church or local hall indicates the continued presence of some feeling of community centred round the township. In dairying districts the local co-operative dairy factory, daily taking in the whole milk or sending out cream trucks to suppliers, helps toward the same end by bringing suppliers together and emphasising their common interest in the development of the district, in increasing the number of suppliers, in the efficiency of management of the factory, and in the receipt of adequate returns. Some dairy companies run co-operative stores.

The second type of rural town is larger, serves a wider area, and has services which the smaller country town is not capable of providing. To reach their customers the shopkeepers of this town will be obliged to deliver perhaps once or twice a week, especially commodities such as meat and bread. In typical country districts the distances to be covered will be too great for regular or casual trips into town by the more distant customers. In this type of town the turnover of groceries and drapery will be larger and the range carried wider, partly because there are more local residents and partly because the presence of a cinema and a wider range of shopping facilities will bring the more remote people on picture night and the weekly late shopping night (7). Thus the sell-

ing of drapery and footwear may be taken over by a special shop competing against the one or two general stores selling drapery as a sideline, and these in turn may be competing with a shop selling only groceries and hardware. The larger or more remote of this type of township will have in addition police station, boot repairer, fruiterer and confectioner, tea rooms, hairdresser and tobacconist, often a transport depot, and sometimes saleyards, a maternity hospital, and a library. This type of township can provide entertainment facilities and cater for those spending a day in shopping—tea rooms and a choice between shops, so that there is some rather primitive scope for comparing prices, qualities, and service. Wakefield, Nelson, is a good example of this type of town. Wakefield also has a builder's workshop, timberyard, radio repairer, and banking agency.

Finally, there is the largest type of country centre, which provides shopping facilities in a more refined form over a still wider range of commodity and service. This implies more than one shop of the same type as well as shops of different types offering a varying range of commodities or degrees of service and competing in the same line of trade—for example, more than one draper's shop, or departmental store, draper, mercer, and tailor selling similar items of clothing. A general store in a town of this size would be something of a relic, though they are sometimes found, especially where there is a large moving population, as in Picton. These are the centres to which shoppers go to make some of their more important and less frequent purchases of clothing, household furnishings, building materials, books and music, chemical, electrical, and farm supplies, and personal and professional services. As well as firms handling farm produce and requirements in bulk, doctors, chemists, dentists, hospitals, lawyers, accountants, land and estate agents, and sometimes State Departments are to be found. Such a town will be the venue of agricultural and pastoral shows and may have a racecourse. These towns are administrative and professional centres for their districts.

Urban Centres

The country towns do not, of course, provide a complete coverage for all the many requirements of the consumer's budget. In the field of high-class entertainment and sport, and in higher learning particularly, the country town cannot compete with the

shop with the addition of butcher and baker (and perhaps another general store) and the shopping centre to which people come to shop from outlying districts which have their own small, general-store type of township.

main provincial centres and cities. That applies with few exceptions in all fields where the highest class of skill⁷ is required; professional or artistic. Whenever the highest quality in printing, publishing, advertising, or dress is required, or when durable goods such as refrigerators, watches, furniture, jewellery, machines, and tools and the more specialised types of books, music, musical instruments, flowers, or shrubs are sought, a journey to or communication with one of the main centres is indicated. The stocking of such items by country shops would involve a great deal of dead stock. The provision of such specialised services as those of laundries, dyeing and dry cleaning works, herbalists, musicians, schools of dressmaking, surveyors, specialist surgeons, chiropodists, plasterers, or signwriters is impossible in country districts. Board and business meetings, holiday travel, races, and sporting events—all these activities attract, and farmers or their wives take the opportunity presented by any such perhaps infrequent visits to urban centres to have the family group taken, to buy new curtains or carpets, washing machines, or ornamental china.

A further distinguishing feature of the three urban centres of the two provinces—Nelson, Blenheim, and Westport—is the development of commercial organisations. There are transport and shipping companies, warehouses, merchants, agents, and bulk distributors of, for example, petrol. In the administrative field are numerous Government Departments, including those of Air, Army, Customs, Health, Lands and Survey, Public Works, and Social Security, in addition to the ever-present railway and post office. Industries include cordial factories, breweries, engineering shops and foundries, building contractors, and cabinetmakers. Local authority activities include gasworks and abattoirs, and in addition professions such as those of architect and undertaker divorced from builder or cabinet-maker. There are business, professional, and worker associations.

Westport differs from Nelson and Blenheim in that, while they are primarily farming centres, the business of Westport mainly depends on the extractive industries—mining and timber milling. Consequently Nelson and Blenheim are characterised by the presence of nurseries, florists, seed and produce merchants, flour millers, and other processors of primary produce and numerous stock and station agents absent in Westport. Altogether they show a more intricate pattern of economic development. In Blenheim and Nelson are many financial institutions, land and commission agents, and insurance offices, all designed to deal with the business affairs of the numerous farmers.

(7) A distinction might be made between the purely delivery centre (the first type of town-

Nelson is much the largest of the three towns and is a popular place in which to retire. It is also a shipping port of some importance. There are shipping engineers, engineers' merchants, foundries, electrical welding establishments, and industries engaged in working in textiles and clothing, building materials, furnishings, and major motor repairs. Stock and share broking and auctioneering are natural additions to the range of financial institutions in a community with many aged people of independent means. Additional Government Departments, such as those of Employment, Broadcasting, and Education, are present.

It follows that, except in farming, the most highly-paid positions are in the cities, so that costs of living are highest there also. It is in the cities that the most specialised types of skill are required, as well as the highest executive positions and the largest branches of firms, for their information, communication, and ancillary services are most highly developed. There also the bulk of primary produce is collected for export overseas and imports and local manufactures are distributed to other parts of New Zealand. It is no accident that the main provincial and urban centres are on or near harbours. These cities are characterised by the presence of a large army of wholesalers notably absent in the purely country centres except for their travelling representatives.

The four or five types of towns form a highly-intricate network, each competing to some extent with the others but justifying its existence by serving a different purpose on the whole. For a rough distinction the towns might be differentiated by calling the smallest the "daily" town and the next the "weekly" town (but to local residents the daily town also); then the district centre would become the "monthly" town and the urban centre the "yearly" town or city.

Shops and Businesses

The keys to an understanding of the structure of towns are knowledge of the proportion of consumers' budgets which is spent on different commodities and services and of difficulties involved in transport. As towns increase in size they add businesses which cater for less and less important and less-frequently-bought items in the consumers' and producers' budgets. Items such as groceries or clothing, which bulk large and are bought frequently, are provided in the smallest country towns. Items which have to be treated separately, such as meat and bread, and which do not absorb nearly as large a proportion of household expenditure, are not usually sold or prepared by

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Collingwood nestles quaintly at the foot of a bluff where the Aorere River winds across tidal flats to the sea. This remote settlement and port has a long history which has fluctuated with the activity in neighbouring gold and coal fields. Grassland farming, as in Takaka, with timber milling now forms the economic background.

special shops in the smallest country towns but are distributed from larger centres. So it goes on until the minor items, especially those bought infrequently, such as medical services or music, are provided only in the larger towns. Durable items or those bought in bulk and therefore infrequently, such as motor-cars, even if quite important in the budget, can also be bought only in the larger centres.

From a tabulation of the proportion of shops of different kinds useful information can be obtained about the importance and frequency of purchase of various items in household expenditure. Such a tabulation for the country areas of the two provinces gives the following results: —

- (a) Mainly food and drink: 105.
- (b) Footwear and clothing: 39.
- (c) Household requirements: 19.
- (d) Stationers and newsagents: 11.
- (e) Personal services: 15.
- (f) Chemists, druggists, photographic services: 8.
- (g) Professional: 27.
- (h) Departmental stores, general stores, stock and station agents: 40.
- (i) Businesses connected with communications and personal transport (garages, taxis, radio and cycle dealers): 70.
- (j) Banks, business and administrative offices: 22.
- (k) Tradesmen (plumbers, blacksmiths, engineers, etc.): 26.

- (l) Hotels, accommodation houses: 53.
- (m) Post offices: 34.
- (n) Theatres: 14.
- (o) Transport depots, carriers, wood and coal merchants: 30.
- (p) Miscellaneous (jewellers, watch repairs, sports goods, florists, etc.): 8.

In addition there were 4 billiard saloons, 21 railway stations, and 9 hospitals. Apart from business premises there were 24 lodges, Red Cross and Plunket centres, as well as schools, libraries, churches, halls, and other public buildings.

From other data collected (8) it is reasonable to assume that the totals give a good impression of the distribution of household expenditure as between items a, b, and c. In comparison businesses of types d, e, and i are high in numbers, but stationery shops usually carry other miscellaneous lines, so that stationery and reading material represent only part of what they sell. Similarly many shops of type e are hairdressers who rely on sales of tobacco and toilet goods for a substantial part of their income. The large numbers under i suggest the importance of tourist traffic in the two provinces, as well as the dependence of many of the important districts included on road rather than rail transport. According to the present state of knowledge, a gradually-rising proportion of businesses providing

(8) Cf. Dolg, "A Survey of the Standards of Life of New Zealand Dairy Farmers," page 88.

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Grangity, the centre for the mining districts of Stockton and Millerton and for small areas of farmland along the coastal strip. [Neville R. Lewers photo.]

professional and other services, transport, and accommodation may be expected, with other increases, perhaps under the headings of household requirements, reading matter, and almost certainly miscellaneous items.

What prevents all the peoples' needs being met from the one centre is the cost of transport, in both time and money. The small country town can compete with the larger country town, despite possibly higher overheads and inferior range and service, because it is not usual to devote the best part of a morning or afternoon or spend more than a few pence on travelling for daily needs. These costs of transport limit the area served by any town.

Thus two distinct influences affect the future of the country town. Rising standards of living and increasing efficiency of transport both tend to favour the large centre rather than the small, at least in the short run. Better living standards tend to increase expenditure on items such as luxury goods and especially services offered by the larger centres and on the number of visits to them, while increasing efficiency of transport tends to widen the area which the larger towns serve.

The advent of the Nelson-Wakefield bus service and its effect on the life

of such towns as Stoke and Richmond is particularly noticeable. In the long run rising living standards may attract new businesses into country districts, but even then they may be losing ground compared with larger centres.

Economic Development

In the light of that knowledge the understanding and interpreting of the economic development of the counties visited becomes easier. Attention is concentrated on shops; offices are confined to the larger country towns, warehouses other than bulk stores for primary produce are in the urban centres, and hotels are affected by the vagaries of the licensing position.

Excluding Sounds County, which is not an economic unit with developed townships and which shows features peculiar to itself, it was found that with one exception there was a shop to every 100 to 150 people in each of the counties visited. The exception was Awatere County, where there was one shop to about 300 people, which illustrates how residents of sparsely-settled sheep country have to be self-reliant in food, relying on bulk purchase of commodities and very occasional journeys many miles to town.

Of the other counties, Kaikoura, Inangahua, Murchison, Takaka, and

Collingwood (the last two taken together being an economic unit with a complete range of country towns) form one group, with a shop to every 100 inhabitants. That may seem a high proportion, but their remoteness from large centres is partly responsible. These counties have to provide internally facilities which in counties such as Buller, Waimea, and Marlborough are readily accessible in Westport, Nelson, and Blenheim. It might seem that shop buildings, shop attendants, stock, and often truck are a heavy load to be carried on the average trade represented by 100 people or about 20 families. In comparison with more populous and densely-settled areas that is so and because, other things being equal, the turnover is less under competitive conditions, a heavier average mark-up would be necessary to cover the higher unit costs represented by overhead, dead stock, transport costs, and labour reward, even if less is swallowed up in rent. Other things would not, of course, be equal if, as in Picton, there was a large tourist traffic.

It follows that under such conditions country areas would have to pay not only for extra transport charges to and from the shop but also because of a higher proportion of shops per head of population, resulting from a lower density of settlement. Under

monopolistic influences and price fixing the price difference between town and country may not be so noticeable, the costs then being spread over the community.

Apparently, if the number of families within the radius which shops can serve falls below a critical level, represented in these districts by an average of about 20 families to a shop, either the mark-up would have to be so high that sales would not justify establishment, or under price control trade would not yield an adequate return for labour and capital invested. Country areas may therefore either have to do without certain services altogether—for example laundries, dry cleaning, and cake shops—or obtain them at greater cost.

The other bracket of counties, Waimaea, Buller, and Marlborough, has about 150 people to each shop. The townships in these populous counties markedly show the effect of proximity to the main centres included within their boundaries. The most extreme examples of that effect are Stoke, Grovetown, and Waimangaroa, near Nelson, Blenheim, and Westport respectively. Rapidly-developing Stoke, with about 130 occupied houses and a population of about 600, has as yet only two shops (one quite new); Grovetown, about one-third the size, has none at all; and Waimangaroa, with about 50 houses, has only one. In those cases, if all shopping is not done in the main centres, then only the daily needs are bought in the local township and the more elaborate and less routine purchases made in the provincial or urban centre. Though Murchison's population is slightly fewer than Stoke's, it has 11 shops; the population of Murchison County is only two-thirds as great again as that of Stoke by itself. Richmond, with 175 houses and 13 shops, is in an intensive farming district; Kaikoura has 210 houses and 33 shops, though, of course, it serves an extensive hinterland.

For a further comparison of both shops and offices, Granity and Takaka offer a splendid contrast. Granity is 22 miles along the flat from Westport, Takaka 80 miles from Nelson, 40 miles from Motueka, and separated from them by a formidable hill. The only weakness is that Granity is centred in a mining district with only a little

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[V. O. Browne photo.]
The straggling, sheltered town of Kaikoura is on the east coast 95 miles south of Blenheim.

dairying, and Takaka in a dairying district supplemented by a large cement works and hydro-electric scheme:—

	Takaka	Granity
Draper	1	2
General store ..	1	1
Grocer	1	
Baker	1	
Butcher	1	1
District high school	1	1
Departmental store	4	3
Stationer	1	
Boot repairer ..	1	
Motor garage ..	2	2
Theatre	1	1
Hairdresser ..	1	1
Cycle repairer ..	1	1
Professional offices	7	2
Other	8	2
	31	17

The differences are, as would be expected, most striking in professional services and other business groups. Takaka has a dentist, two doctors, an accountant, solicitor's offices, a plumber and tinsmith, milk bar, beauty salon, chemist, two men's outfitters, engineer's workshop, hospital, and tea rooms. The important point revealed is that the difference lies not so much in the number of shops of the same type, as densities of settlement are much the same, but rather in the diversification of types. At the time of the visit Wakefield (nearly 20 miles from Nelson), and Brightwater (14 miles from Nelson) each had a motor garage, a hotel, two shops of the general store-grocer type, a baker and pastrycook, and a cycle or radio repair dealer; but Wakefield had in addition a butcher, confectioner, two

hairdressers, and tobacconists, tea rooms, builder, timberyard, blacksmith's forge, theatre, and banking agency. Both have the same population situated in farming districts equally intensively settled.

Other interesting variations are also shown from town to town. Picton, for example, with a number of tea rooms, a souvenir shop, launch offices, several hotels and accommodation houses, and shops specially featuring camping requisites, shows its dependence on the tourist traffic. Reefton, with 12 out of 39 shops unoccupied, has had a markedly-different recent history from Kaikoura, with only two out of 35 shop premises unoccupied. Farming activities of the district also have an influence: Retail butchers' shops are not expected in districts given over to pastoral farming, while in the prosperous town of Motueka are a bookseller and printer, a sports goods store, electrical and radio dealers, watch and cycle repairers, cake shop, a wine and spirit merchant, a tailor, and dealers in furniture, leather goods, hardware, and crockery—quite an impressive list of near-luxury items.

The destination of the farm produce is important, too. For example, extensive pastoral farmers who truck their wool direct to the larger centres are independent of the smaller country towns in a way that dairy farmers who send their milk or butterfat to the local factory are not.



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Teeth Indicate Age and Feeding Habits of Domestic Animals

By D. MARSHALL, *Livestock Superintendent, Wellington.*

TEETH, once an animal's preservation in danger and vital to its life in searching out food as it roamed the jungle or the wild, have now in its domesticated state an extra significance in that from the teeth, by the shape, condition, and arrangement in the jaw, several important points can be learned. Farmers rely on the teeth of animals chiefly to indicate age, but also they are a reliable guide to feeding habits.

VARIATIONS in the teeth of animals are caused by feeding habits. A common arrangement is 6 grinding teeth sometimes classified as 3 premolars and 3 molars, but usually called cheek teeth, on each side of the upper and lower jaws; 6 incisor teeth in front of each jaw, and 2 canine teeth in each jaw, set on each side between the front cheek tooth and corner incisor and nearer the incisor.

The canine teeth are well developed in carnivora—dogs, lions, tigers, and aquatic mammals such as the walrus. In land carnivora they assist to grip the prey, and are highly developed in elephants and male pigs. Their main use in all these animals is as a weapon. Canines in horses are normally present only in the male, though some mares have small canines or "tushes." A variation occurs in the ruminant, which has 8 incisor teeth in the lower jaw only, two of which are believed to represent the canines.

Teeth are further divided into temporary or milk teeth, present at or soon after birth, and permanent teeth which in most cases replace milk teeth. The exceptions are the 3 farthest-back cheek teeth on each side of both jaws. The young colt or calf has only 3 upper and lower cheek teeth on each side, which is all that its jaws will accommodate. These are later replaced by 3 permanent teeth, but the posterior 3 permanent teeth, which are not represented by milk teeth, come in behind them.

The permanent teeth replace the milk teeth at fairly definite periods, and their regular appearance in order is a main guide in determining age.

Structure of Teeth

A tooth can be described as consisting of a **crown**, the portion above the gums; the **table**, the top or wearing surface; the **neck**, in the gum; the **fang**, embedded in the bony socket of the jawbone; and the **roots**, small projections of the fang.

Three substances compose the tooth: Enamel, a dense white substance covering the crown or most of it, and in the case of herbivora also forming

folds in the substance of the tooth; dentine, making up most of the body; and cement, which fixes the tooth in the socket and in mature animals covers much of the crown. Variations in this arrangement occur, however, in different animals.

Teeth of Domestic Animals

Characteristics of the teeth of a range of domestic animals are as follows:—

Dogs: The teeth of dogs are fitted for cutting or tearing. The front cheek teeth have a rather sharp cutting edge. The dog has practically no lateral movement of the lower jaw, so that no grinding movement takes place between the upper and lower cheek teeth. There is little wear on the tables, and the teeth usually remain enamel-covered and white.

Pigs: The incisor teeth in the lower jaw of pigs are directed forward. The cheek teeth are fitted for crushing or champing movements, but no actual grinding takes place. There is exceptional development of the canine teeth or tusks in the male. These tusks have a permanent pulp cavity or living root and continue to grow during life.

Horses: The incisor teeth of horses, described as 2 centrals, 2 laterals, and 2 corners, are adapted for cutting or cropping grass or other fodder so that the horse is able to graze close to the ground. When first erupted the permanent incisors show on the table a deep depression lined with enamel, which persists as an elliptical hollow or cup for about 2 years after the tooth comes into wear. As the tooth wears down the cup disappears, but the ring of enamel with a dark-stained centre of cement persists as the "mark." As different sections of the tooth progressively come into wear the mark changes its shape. The cheek teeth, somewhat rectangular on the table surface, are large and strong. As considerable grinding takes place the teeth slowly wear, and the edges of the hard enamel outer layer and infoldings project as ridges above the softer dentine to maintain a good grinding surface.

Oxen: The 8 incisor teeth of oxen, present in the lower jaw only, are shovel-shaped in the young adult, with a definite neck above the gum, and are not fixed so firmly in the jaw as those of the horse. A fibrous pad replaces the incisors of the upper jaw, and the ox does not crop grass, but grips it between incisors and pad and tears it off. The cheek teeth have well-marked folds of enamel on the outer surfaces, projecting as uneven ridges in the table. There is free grinding movement between the rows.

Sheep: In general the teeth of sheep resemble those of oxen. The cheek teeth have well-marked enamel ridges in the outer faces, while the incisors are closer set and allow shorter grazing.

Wear of Teeth

Reference to the wear of teeth is confined to the incisors, since the condition of the molars cannot be determined readily.

In certain strains of horses heredity is suspected to have an influence on the wearing quality of teeth, while it has been noted that grazing causes greater wear than stall or hand feeding, which may lead to teeth indicating an age greater than the real age.

With sheep on country where grazing is liable to contamination by grit, through drought, flooding, or topdressing, wear on teeth may be due to closer grazing following heavier stocking at certain seasons.

The theory that the rate of wear was largely influenced by the type and supply of feed was advanced by A. Leslie, F.R.C.V.S., in an article on the teeth of sheep, in the September, 1933, issue of the "Journal." He showed that dry 2- and 4-tooth ewes had sounder teeth than pregnant animals of the same age on the same feed. The dry ewes were also better grown, indicating that the diet was insufficient for a pregnant animal. Further investigation is required into this matter, but where teeth are found to be wearing unduly consideration should be given as to whether feed in the early years has been maintained at an even and sufficient level without periods of semi-starvation.

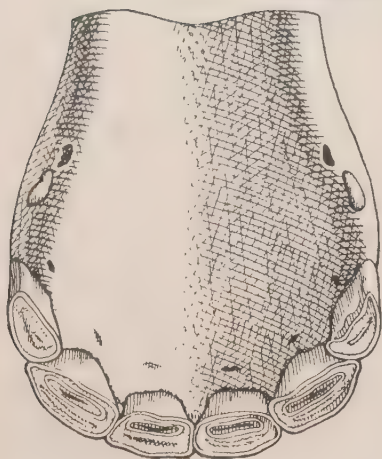
Estimating Age from Teeth

Horses

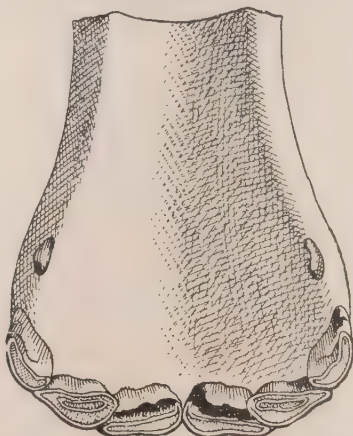
As a rule with horses only the incisor teeth, chiefly the lower set, are examined in estimating age; additional information could be gained from the cheek teeth, but inspection of these is more difficult. The main points in estimating age from teeth are:—

1. The number of milk teeth or permanent teeth (if any).

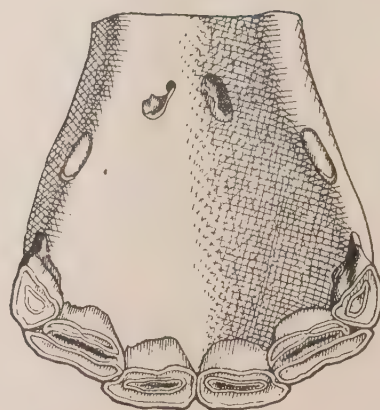
HORSES' TEETH THROUGH THEIR LIFETIME



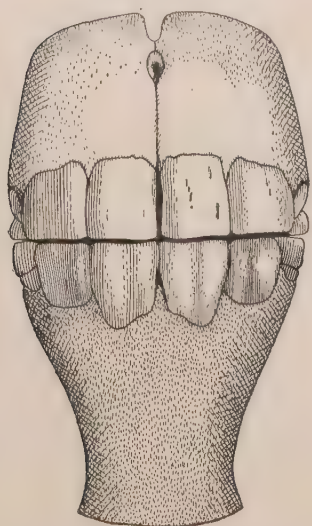
1. Lower incisors ("milk teeth") of a 2-year-old horse.



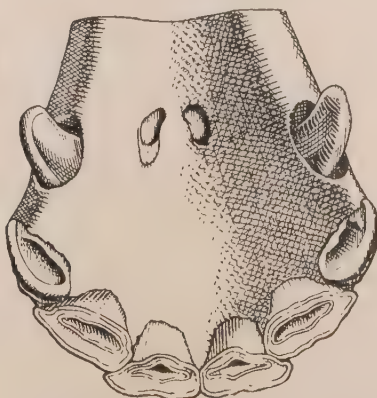
2. Lower incisors of a 3-year-old horse. The central pair of permanent incisors is present, but not in full wear.



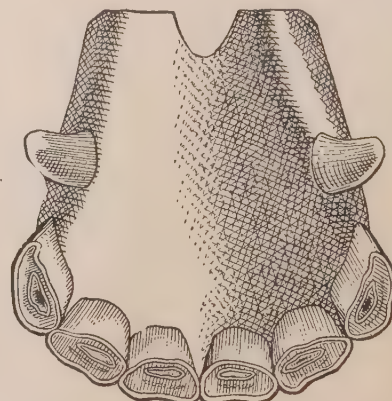
3. Lower incisors of a 4-year-old horse (table view). Second (lateral) pair of permanent incisors is present, and the first pair is now in full wear.



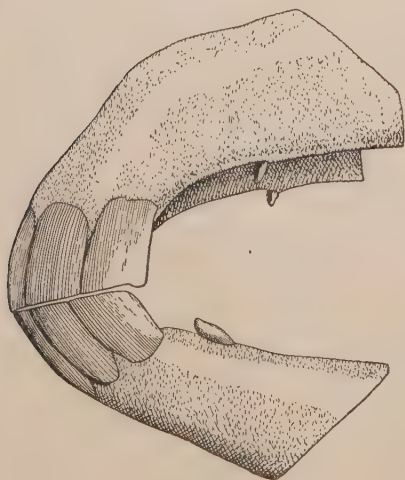
4. Anterior view of upper and lower incisors of a 4-year-old horse.



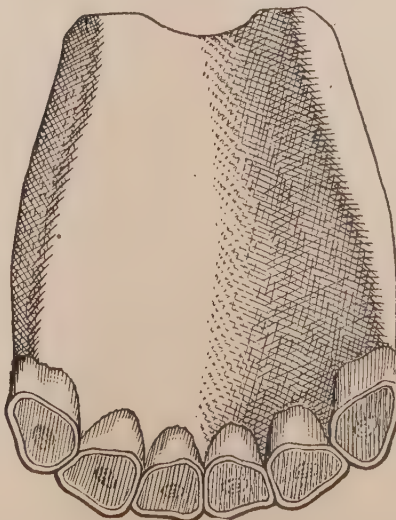
5. Lower incisors of a 5-year-old horse. Corner pair of permanent teeth and also canines are appearing.



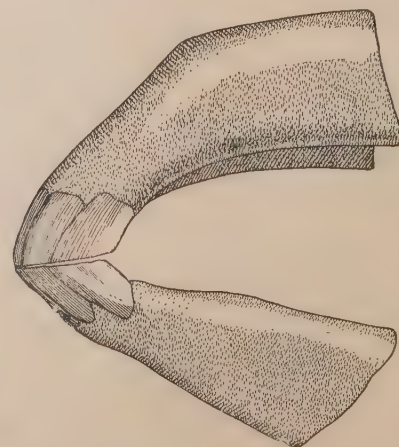
6 Lower incisors of an 8-year-old horse. "Mark" has left centrals and laterals and is leaving corner teeth. Note rounder shape of tables in centrals and laterals.



7. Lateral view of incisors of a 9-year-old horse.



8. Lower incisors (table view) of a 16- to 20-year-old horse. Note rounding of all tables.



9. Lateral view of the incisors of a 16- to 20-year-old horse. Note angle now formed by two rows.

DEVELOPMENT OF AN OX'S TEETH

2. The shape and marking of the table or wearing surface.
3. The angle which two rows of teeth make with each other.
4. The shape of the upper corner incisor, and the marking of the outer surface.

It is necessary in using this guide to distinguish between temporary and permanent incisors. The difference is evident when horses are between 3 and 4½ years of age, as both kinds are then present. To understand the second point above it must be realised that the tooth is gradually coming up out of the jaw and wearing away at the table, so that the table at successive ages represents cross sections of the tooth at different levels.

The central pair of milk teeth is present at birth or within a few days after; the laterals at 8 to 10 weeks, and the corners at 6 to 9 months. A simple way to remember this is: 9 days, 9 weeks, 9 months.

At 1 year the corner teeth will be meeting their opposites, but only at the anterior corner, the edge showing a curve.

By 2 years the corners are meeting along the whole of the table. There is a close resemblance between the incisors at this age and those of an adult, and if the colt is well grown and handled, it may be a little difficult to decide that it is two years old, but the presence of only 4 top and bottom cheek teeth on each side will decide the matter (see Fig. 1).

At about 2½ years the necks of the central pair of teeth become evident, and within the next month they will be pushed out by the permanent central teeth.

At 3 years, therefore, there are 2 permanent central incisors meeting their opposites in each jaw (see Fig. 2). At 3½ years a similar change occurs with the laterals which at 4 years should be level with the centrals (see Figs. 3 and 4).

Between 4½ to 5 years the corners are changed and at 5 years will be meeting their opposites, but not completely, as illustrated in Fig. 5.

The canines or tusches should appear in the male between 5 and 6 years, after which the guide is the appearance of the table.

At 6 years the cup or hollow has disappeared from the central pair, though an enamel ring is still apparent. The corners now meet their opposites fully.

At 7 years the cup leaves the lateral pair, and about this time a hook or projection is evident at the rear angle of the upper corner tooth.

At 8 years the cup leaves the corners and from now on estimation of age is merely an intelligent guess (see Figs. 6 and 7).

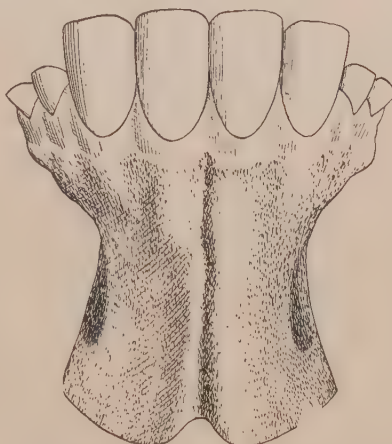
At 10 years the beginning of a small groove, Galvayne's groove, on the out-



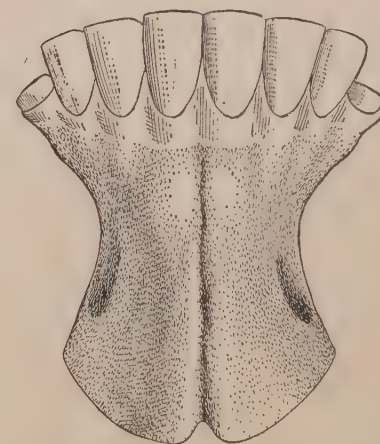
10. Incisors of a 1-year-old ox: 8 temporary (milk) teeth.



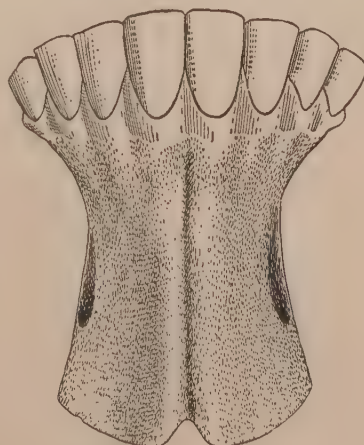
11. Incisors of a 2-year-old ox; 2 permanent teeth (centrals) are in wear.



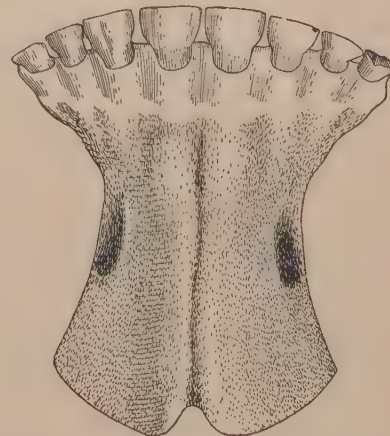
12. Incisors of a 3-year-old ox; 4 permanent teeth are in wear and intermediates are up.



13. Incisors of a 4-year-old ox; 6 permanent teeth are in wear and corners are up.



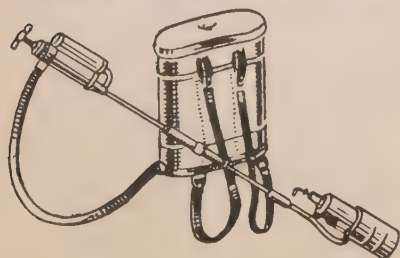
14. Incisors of a 5-year-old ox; 8 permanent teeth are in wear.



15. Incisors of an aged ox. Teeth are worn down and separated and necks are appearing.

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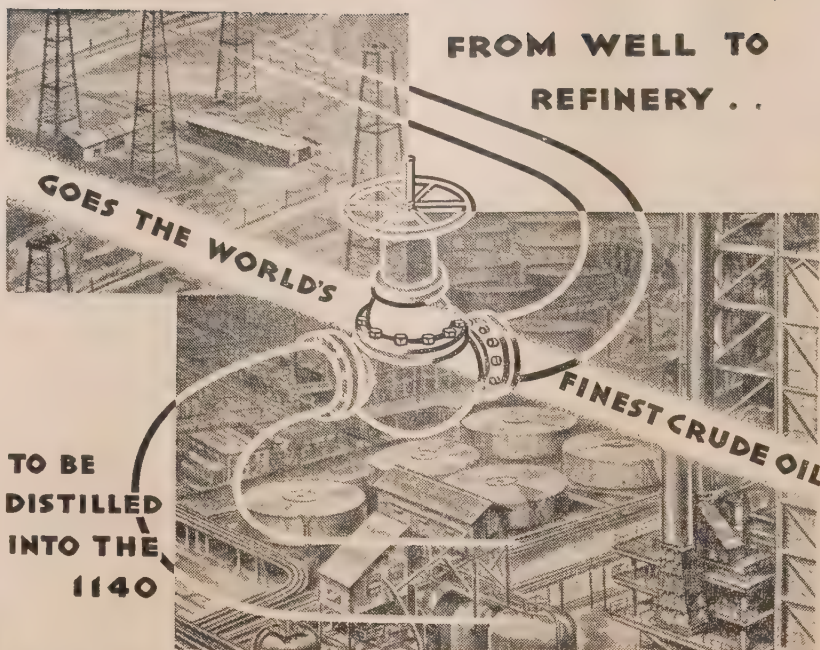
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COPPER DEFICIENCY IN CATTLE AND SHEEP

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side face of the upper corner may be seen leaving the gum.

By 15 years the groove is half-way down the tooth, with the central teeth becoming rounder and deeper from front to back.

By 20 years Galvayne's groove has reached the table. The tables are all deeper from front to back, and the teeth occupy only the front of the jaw instead of a semi-circle, while the angle formed by the 2 rows of incisors has become almost acute (see Figs. 8 and 9).

In old horses the cheek over the molar roots is hollow instead of convex.

Cattle

The central and lateral pairs of incisors in cattle come through the gums at or soon after birth so that the calf has 4 incisor teeth within a few days. The third or intermediate pair appears at about 2 weeks, and the corners at about 4 weeks, reaching the level of the others by 3 months.

At 1½ years the centrals are shed and replaced by 2 permanent incisors which will be up and in wear by 2 years.

For roughly the next 3 years the changes in teeth are as follows:—

Years

- 2½ to 3 Laterals shed and replaced.
- 3½ to 4 Intermediates shed and replaced.
- 4½ to 5 Corners shed and replaced.

In each case the new teeth usually reach the level of the other teeth about 4 months later, but these times may vary slightly (see Figs. 10 to 14).

From the last age given above, the teeth beginning with the centrals lose their shovel shape, the tables become rounder, and the teeth instead of forming a semi-circle lie together across the front of the jaw (see Fig. 15.)

Sheep

The following table gives the normal times at which the temporary and permanent incisor teeth come through the gums.

	Temporary (Weeks)	Permanent (Years)
Centrals ..	birth to 1	1 to 1½
Laterals ..	1 to 2	1½ to 2
Intermediates	2 to 3	2½ to 3
Corners ..	3 to 4	3½ to 4

It will be noted that a period of six months is set to cover the earliest and latest times of eruption of the permanent teeth, but variations beyond this period may occur.

Terms Used with Sheep

The following terms are used in referring to sheep:—

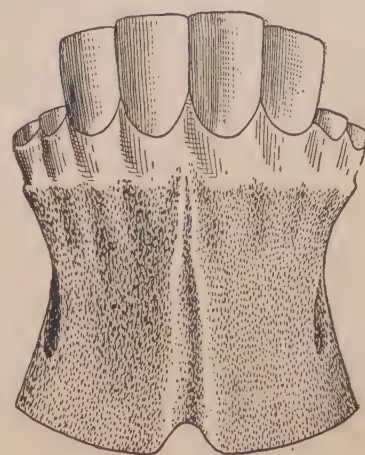
Lamb: A name commonly applied from the time of birth of the animal until it is 1 year old and the next lambs appear (see Fig. 16).

Hogget: A term used rather loosely. Under the meat-grading regulations

... DEVELOPMENT OF A SHEEP'S TEETH

for local consumption the hogget has been defined as an animal "with not more than 2 broad teeth," and therefore between 1 and 2 years old. This is a butcher's definition. Sometimes the term hogget is used to refer to animals approaching 1 year old. In Otago it is common to speak of sheep in their first year as hoggets from about May until they are shorn, when they become "2 tooth," whereas in the North Island they are usually called "lambs" right through their first winter.

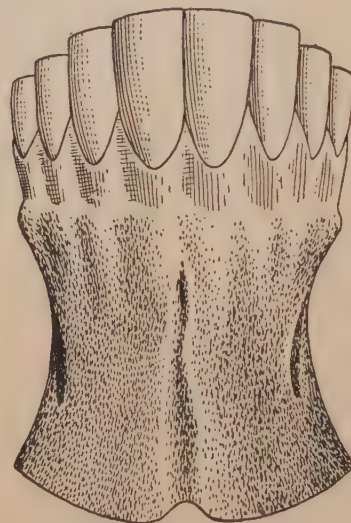
2-tooth: This is the sheep man's term for the animal in its second year (see Fig. 17). During the second year, however, the second pair of incisors normally appear, so that an animal with 4



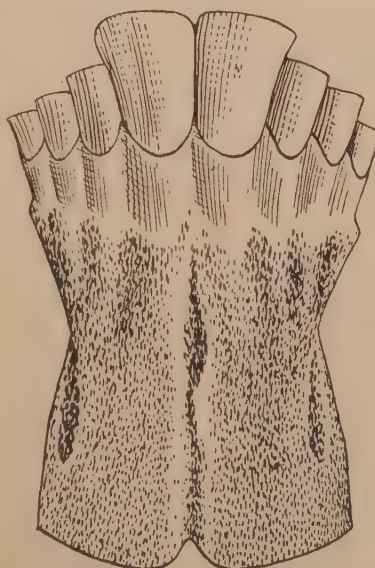
18. Incisors of a "4-tooth" sheep; 4 permanent teeth up.



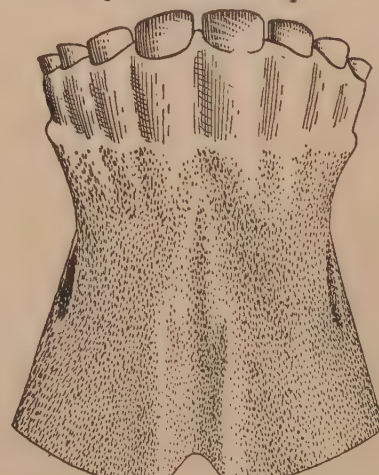
16. Incisors of a lamb 4 to 12 months old. All temporary incisors are up.



19. Incisors of a "full-mouth" sheep; 8 permanent teeth up.



17. Incisors of a "2-tooth" sheep; 2 permanent teeth up.



20. Incisors of an aged ("failing mouth") sheep over 5 years.

ANIMAL TEETH . . .

incisors, 2 fully up and in wear and the second pair through the gum but not in wear, may still be barely 2 years old if the period is early spring.

4-tooth: A 4-tooth is an animal between 2 and 3 years old with 4 incisors in full wear (see Fig. 18).

6-tooth: A 3-year-old sheep, but if the third pair of teeth are just showing it will be barely three.

4-year-old: The 4-year-old will have 8 permanent teeth and may be termed a "full mouth." The term fresh full mouth is also used to indicate sheep just 4 years old, or with the last pair of teeth coming into wear (see Fig. 19).

5-year-old: A sheep may be so described when it is full-mouthed or sound-mouthed, though sound-mouthed may also be applied to older sheep, with all their teeth still present.

Failing-mouthed: The teeth of this type of sheep are wearing down and are smaller. One or 2 teeth may be missing (see Fig. 20).

Terms such as "1-shear" or "2-shear" are also used, chiefly with rams, and mean that the animal is about 1 year old or 2 years old, plus so many months, depending on the time of the year.

The average has been indicated, but variations are common, as permanent teeth may appear earlier or later than the times given. An instance is known of a sheep in its third year still having milk teeth.

As a breeder has put it, sheep teeth have as many vagaries as the weather.

DRAG FOR CLEANING DAMS

Implement Which Has Proved Effective In Manawatu

FOR cleaning dams which provide water for stock, without the necessity for emptying the dam, an implement is being used very effectively in the Manawatu district. In this article A. J. Galpin, Fields Instructor, Palmerston North, describes the equipment and the method of operation.

ON most of the heavy clay rolling country of the Manawatu and lower Rangitikei districts the dam is still popular as a source of supply of water for livestock. Permanent streams are few and artesian water is difficult and often impossible to obtain. The dam, generally located at the head of a gully and so situated as to supply water to more than one field, has been adopted as the least expensive and best method of providing water for stock.

While these dams keep remarkably clean for many years, in time certain twitch grasses and water weeds tend to grow out into the water, reducing the capacity of the dams to the extent where cleaning out this mass of rubbish has to be undertaken. This is no easy job, especially as the heavy, waterlogged mass has to be lifted well clear of the sides of the dam. Cleaning, whether by hand or with the horse or tractor scoop, generally required the dam to be emptied while the work was done.

Messrs. Hodgson and Romley, of the Manawatu, set about the solution of this problem of cleaning dams badly reduced in capacity by the growth of grass and water weeds and the result of their efforts is the equipment illustrated in this article. It has been used very effectively on several old dams in the district. The implement used is a heavy drag with three strong teeth of suitable dimensions, manipulated by two tractors, one on each side of the dam, and working in line with the pull on the drag. The drag is operated between the tractors by two lengths of strong wire rope connected from each tractor to opposite sides of the drag. The drag is hauled to one side of the dam by the light tractor, dropped into position, and the heavy tractor pulls it from one side to the other, getting the necessary lift at the near side to take the material gathered up the bank by the manipulation of the light tractor against the pull of the heavy one.

The drag has been so designed and balanced on the wire ropes that when dropped into the dam it does not swing or twist. The teeth or prongs have been curved to give clearance as the drag is hauled up the sides of the dam, at the same time allowing for penetration of the dense material and the gathering of a full load.

The implement is solidly built of 3in. x 1½in. steel bars. It is 4ft. 6in. long and 3ft. wide and the teeth are about 2ft. 6in. long. Operated by two tractors this machine has cleaned badly-overgrown dams in from 3½ to 7 hours, depending on the size of dams and the denseness of the vegetation.



The drag, showing construction and fore and aft attachments for the wire ropes to the tractors.





TRACTOR INTER-RROW CULTIVATORS

By C. J. CROSBIE, *Assistant Machinery Officer, Christchurch.*

TRACTOR inter-row cultivators, although still in their infancy in New Zealand, came into prominence during the war. The Services' Vegetable Production Scheme utilised them to their fullest extent on the many projects devoted to vegetable growing. A few private growers were, however, using them in pre-war years, and today there is a growing realisation that they are an asset to any grower who farms on a scale sufficiently large to own a tractor. This article deals with the mechanical aspect of tractor inter-row cultivators and describes the types of tool bars and the many attachments that are available for them.

THE modern row crop tractor includes the following distinctive features:—

1. High ground clearance.
2. Narrow-rimmed wheels.
3. Wheels adjustable for the various row widths.
4. Small turning radius.
5. Ample provision for attaching the multitude of fittings.
6. Special lifting devices which are becoming standard equipment.
7. Rear wheel brakes.

This tractor, compared with the general-purpose tractor, provides for greater clearance, both vertically and horizontally, has quick and short turning ability, and is conveniently and easily handled.

Because crop and soil conditions vary, row crop models are produced by some manufacturers in two or even three sizes. Although there is considerable variation in the design and construction of individual machines and equipment, the trend appears as follows:—

Type: The majority of models on the market are of the three-wheeled type, but machines with two front wheels on an adjustable axle are not uncommon. Special wide-treaded crawlers with narrow grouser plates are also used for this work.

Power: There are three sizes powered to about 10, 17, and 24 horsepower respectively.

Speeds: Four to six forward speeds are provided, giving a working range of two to five m.p.h. and a road speed up to as high as 17 m.p.h.

Capacity: The three sizes would pull under normal conditions one-, two-, and three-furrow ploughs respectively and two-, four-, or six-row cultivators.

The tractor may be all steel or may have rubber tyres fitted to the front wheels and steel to the rear, but the combination of rubber tyres and steel has generally proved superior. The steel wheel in general use has a flat rim fitted with spade lugs or A grips, but a special steel wheel, the skeleton or tip-toe type, that is practically self

Photo in heading by Sparrow Industrial Pictures Ltd.

TRACTOR INTER-ROW CULTIVATORS



Upper—A tractor with a parallel tool bar specially fitted with knife weeders to cultivate seven rows of peas sown with a 15-coulter drill. Middle—Cultivating a tobacco crop with a tractor fitted with a parallel tool bar. Lower—A hand-lift cultivator fitted to mould up four rows at a time. Two other moulders are working on either side of the engine.

cleaning is available for work in sticky soils.

For work in crops with narrow row spacings it is desirable to run only one front wheel between the rows and for this purpose the tractor may be fitted with a single front wheel or two front wheels on an adjustable axle. This is preferable to two front wheels set about 8 in. apart. Fitting the tractor with pneumatic tyres in front makes for easier steering and faster turning, with less strain on the operator, who at the ends of the rows is busy lifting the tool bar, turning the tractor, and counting the rows to get the point for the next "turn in." Narrow rubber tyres for the rear wheels are available and have proved satisfactory.

The chief advantage of the row crop tractor is that it will do most general farm work as well as the conventional type of tractor, but in addition can be applied to a great variety of operations which the other type cannot perform. In New Zealand sales of row crop tractors are on the increase and their use is gradually spreading. They are now in use with almost all field and garden crops grown on a field scale. The illustrations accompanying this article show row crop tractors in different districts of New Zealand, indicating that the Dominion's system of farming offers no difficulties to these versatile machines.

Development of the Tool Bar

The first cultivating machine to be built to replace the tedious hand hoe was the rigid, single-row horse hoe, and it was but a simple step to equip it with an expanding frame which was adjustable to work in various widths of rows. The parallel expansion type proved superior, for certain tools must always face squarely to their work and this was not possible with hoes whose side members were hinged at the front and adjusted to any width by a clamping screw acting on the rear cross-member.

As the acreages to be cultivated increased a need for wider machines was felt and the two-row horse hoe was produced. This unit had two trailing gangs suspended from a framework on two wheels that could be adjusted to suit different crops. They were pulled by two horses harnessed to a pole and forecarriage or to a pole attached direct to the hoe. Improved models were fitted with a seat for the driver and some even had foot steering attachments. Multi-row implements were also developed and generally they resembled the standard field cultivator used today. The tines, however, were placed in such a way that gaps were left to accommodate the rows of plants.

Later it was found that with these larger and heavier models the horses

tired in the hot afternoons and that when tractors were used to supply the motive power more ground could be covered in the working day. When this was realised it was but a further step to make the cultivator into an integral part of the tractor, and eventually specialised row crop tractors with their accompanying inter-row cultivators were developed. With these machines and their wide range of attachments it was possible to tend a crop from the seed to the harvest.

TYPES AND POSITIONING OF TOOL BARS

The tool bar may be regarded as a frame to which cultivation tools can be clamped in any desired combination to form a unit warranting tractor haulage. It is attached to the tractor in such a manner that it may be raised and lowered at will while working. The link fittings allow it to be fitted to or detached from the tractor by one or two men in a relatively-short time. The various tools are clamped to the tool bar with simple but strong clamps that lend themselves to easy adjustment, usually by slackening a set screw.

Because the growth habits of crops vary so widely manufacturers have developed different types of tool bars to suit individual conditions. This does not mean, however, that a separate tool bar is needed for each crop, as the one type will be suitable for several crops of a similar height. Usually the single or parallel tool bar (see Fig. 4) will accommodate most of the lower-growing crops, and the offset and zig-zag bars are designed for working among the taller crops like maize as well as the lower-growing crops. The height of the crop at cultivation time determines the type of tool bar to be used, as all tool bars are designed to accommodate any lateral adjustment necessary.

The different types of tool bars described below are grouped according to their positioning (see Fig. 4).

Type A—Fitted Between Tractor Wheels

Fitting the tool bar between the front and rear wheels of the tractor allows better and easier cultivation with less strain on the operator. The main tool bar is in full view at all times and he can steer the tractor to follow the rows with greater ease than if the tool bar was located elsewhere. Because of their location these tool bars lend themselves more readily to adaptation to suit different crops and therefore different types have been developed.

The zig-zag bar has been evolved for two-row machines and can be used to cultivate both tall and short crops planted in fairly wide rows. It is not suitable for crops planted in narrow

rows, as the width of the tractor chassis limits the spacing between the two gangs. Tools are staggered along the beams to give a complete coverage of the centre inter-row and to cover half of the two outer rows, so that by straddling two rows of crop at a time the whole field is eventually cultivated. Rear lateral tool bars are fitted to wipe out the wheel marks, and a central rear tool bar can be fitted when necessary to take the moulder for potato work (see Fig. 3). A side view of the zig-zag bar fitted with a hydraulic cylinder lift is shown in Fig. 9.

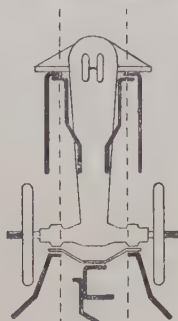
The offset bar is most adaptable and can be used for all units from one to

six rows, which is about the widest unit that can be used effectively, as the turning of larger implements would require a very wide headland that is unproductive. This type of bar is usually linked to the main cross-beam with parallel links and therefore each bar is free to follow the contours of the ground. This is of greater importance with the larger cultivators, as greater variations in the soil surface will be met as the width of the unit increases. The lateral bars at right angles to the main beam of the offset tool bar are held with adjustable clamps and may be adjusted to suit the width of the inter-rows.

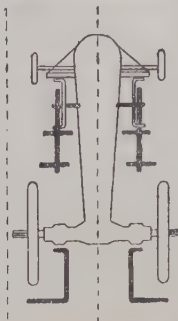
TRACTOR INTER-ROW CULTIVATORS

TYPES AND POSITIONING OF TOOL BARS

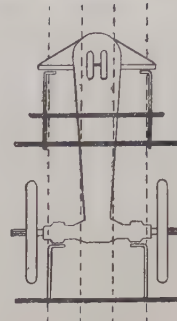
Type A—Tool bar between tractor wheels



**ZIG-ZAG
TOOL BAR**

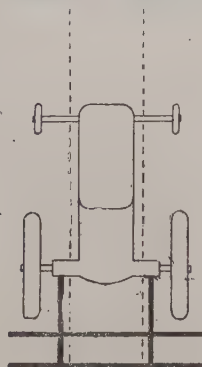


**OFFSET
TOOL BAR**

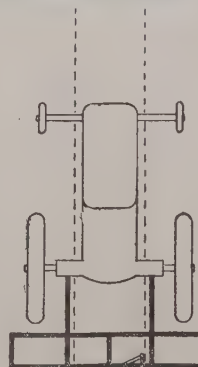


**PARALLEL
TOOL BAR**

Type B—Tool bar behind tractor

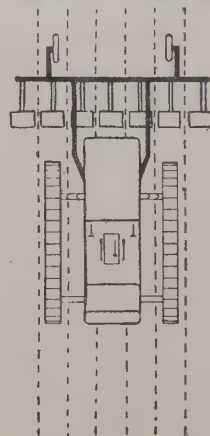


**PARALLEL
4 TOOL BAR**



**ADJUSTABLE
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Type C—Tool bar in front of tractor



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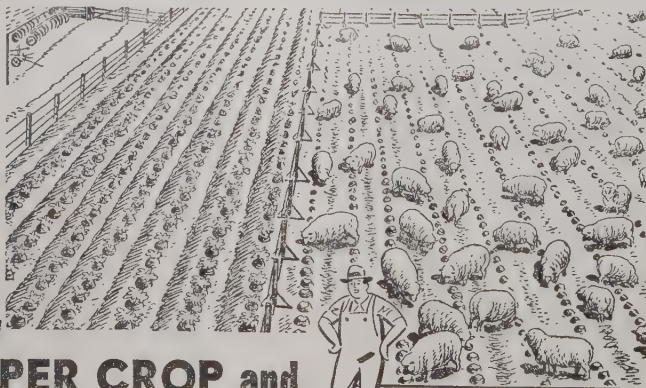
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TRACTOR INTER-ROW CULTIVATORS

Each tool bar with its cultivation tools fitted gives a complete coverage of the inter-row. The working depth of each bar may be controlled with a master lever, or each may be fitted with a land wheel. A side view of the offset bar is shown fitted with a motor lift in Fig. 9 and a close-up view is given in Fig. 7.

The parallel tool bar is eminently suitable for the lower-growing crops planted in narrow rows, because the tools attached may be fitted in any position along the length of the bars to suit the particular row spacings being worked. It can also cultivate up to four and six rows at wide spacings, but for this purpose the bars are divided into two gangs to give greater flexibility in following the ground contours. Special attachments are obtainable for mounting this type of bar on a tractor already fitted with a zig-zag bar so that a crop planted in narrow rows may be dealt with as well as crops with wide spacings. A single bar fitted at the rear of a tractor with a parallel tool bar is convenient for mounting tools to remove wheel marks (see type A, Fig. 4).

Tool bars can be centrally mounted only on tractors that are of the row crop type. The models illustrated are specially designed for row crop work and provide the necessary clearance to accommodate the tool bar in the central position.

Type B—Fitted Behind Tractor

It is possible to do row crop work with the conventional type of tractor, provided the crop is planted in rows spaced to suit the wheel tread of the tractor. On these tractors the tool bar used is generally of the parallel bar type and is fitted behind the tractor. This makes it possible for a grower with a general-purpose tractor on a small farm to carry out inter-row cultivation without going to the expense of buying another tractor of the row crop type. However, if the tractor on hand is becoming old, it may be wiser to trade it in for a row crop model, which is capable of doing standard farm work as well as row crop cultivation.

Tool bars mounted behind the tractor are not as popular as those centrally mounted, as the operator has to keep turning round to keep the tool bar in view and at the same time watch for blockages and ensure that no damage is done to the crop. Should the tractor close in on the rows and cause the tools to work too close to the plants, difficulty will be experienced in getting it back into the centre of the inter-rows without damaging the plants. When the nose of the tractor is turned out the tool bar at the back swings closer to the plants and several may be destroyed before the tractor's course is corrected. Alternatively, the tractor can be stopped, the tool bar



Upper—A hand-lift cultivator being used to keep down weeds before the crop emerges. The adjustable standards have been fitted with 6in. sweeps for this work. Middle—An offset tool bar fitted to a tractor to work a weedy crop. As the ground is stony, spring-trip standards have been fitted. Lower—A close-up view of an offset tool bar. Note that lateral adjustment is provided by the side bars and that parallel links are used to attach the tool bar to the main crossbeam. The front axle is adjustable.

TRACTOR INTER-ROW CULTIVATORS



The hand lever on this locally-made cultivator can cause a 6in. lateral movement of the tool bar, a feature which is appreciated when difficult rows are being worked.

lifted, and the tractor moved away from the plants before cultivation is recommenced. To enable this to be done several tool bars are adjustably mounted on the gang beams so that a lateral movement of up to 6in. is provided if necessary (see Fig. 8). This feature of tool bars fitted behind the tractor is discussed further in a later section of this article.

Type C—Fitted in Front of Tractor

Mounting the tool bar in front of the tractor is not common, although it has advantages. This type of cultivator, shown in Fig. 4, is fitted to a crawler and consists of a number of small rotary hoes working between the rows. Each is pivotally mounted to a single tool bar and is thus free to follow contours of the ground. The rotary hoes are powered by a small engine mounted above the tool bar.

Tool bars can be fitted forward of the conventional type of tractor and are especially useful for splitting back ridges in the spring. The ridges are split and new ones formed in front of the tractor, which tracks in the furrows. With tool bars mounted at the rear of the tractor it was necessary to run the tractor on top of the ridges that were being split, and difficulty was experienced in doing this. Special rims had to be fitted to the front wheels of iron-shod tractors. Now, however, the use of the tool bar mounted forward obviates this difficulty. Recently a special tractor made to take a tool bar in this position appeared on the English market and will prove useful in districts where it is the practice to split back ridges.

LIFTING MECHANISMS

To assist in the raising and lowering of the tool bar row crop tractors can usually be fitted with a device known as a power lift, which uses some of the tractor power. Power lifts, besides relieving the operator of this heavy work, permit faster raising and low-

ering of the cultivator, which can usually be done while the tractor is in motion. This action cannot be carried out with the hand lift, which is usually fitted only to single-row and the lighter two-row cultivators. For the heavier two-row, three-row, and four-row units the hand lift is optional, but a power lift is an advantage and for the six-row plant it is a necessity. Even if the lifting system of the six-row unit were fitted with compensating coil springs, the operator from his seated position could not apply the necessary weight to a hand lever to ensure the fast and positive lift required.

The various types of lifting mechanisms described below are illustrated in Fig. 9.

Hand Lift

The hand lift consists of a simple system of levers operated by hand from a position convenient to the driver's seat. The hand lever works across a quadrant in the usual manner and may be locked in any position between "up" and "down." A long

push rod takes the motion forward to a bell crank fitted to the main cross-beam and thence through a vertical lift rod to the gang beam and so to the tool bar. The parallel rod shown above the gang beam ensures that the tool bar will always be parallel to the ground at any depth of cultivation and also when out of the ground. The lift rod is fitted to the bell crank with two set collars and a coil spring in such a manner that, though a positive lift can be obtained when required, the tool bar is free to follow the contours of the ground when cultivating and is returned to its normal working depth by the pressure spring should it rise temporarily when passing over an obstruction. The hitch between the horizontal push rod and the bell crank is also arranged with a set collar and a tension spring to accommodate any abnormal rise and to return the tool bar to its normal position. A similar arrangement of levers, lift rods, and pressure springs controls the depth of the rear gang, but because in many cases the rear gang consists of two separate bars fitted with tools behind each rear wheel for the sole purpose of wiping out the wheel marks, it is usual to use a rock shaft instead of two bell cranks to convert horizontal motion into vertical motion.

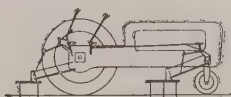
Hand lifts should be fitted only to the lighter cultivators, as the work of lifting and lowering a tractor cultivator at the ends of each row will tire any operator.

Pneumatic Lift

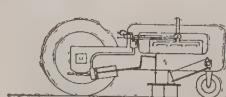
The pneumatic lift uses exhaust gas from the engine to create pressure in a cylinder against a piston which is connected by a system of levers and a rock shaft to the tool bar. Pulling the control lever closes a pressure valve located above the exhaust manifold, and gas is diverted past a control valve to the cylinder, where pressure builds up and forces the piston out. When the cultivator is raised pressure builds up in the system and an automatic release allows the control lever to return to its neutral position.

LIFTING MECHANISMS FOR TRACTOR TOOL BARS

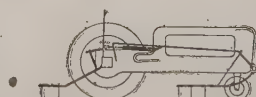
Illustrating principles only — not to scale



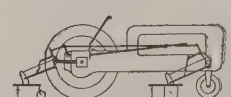
HAND LIFT



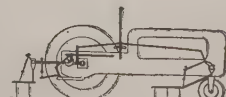
PNEUMATIC LIFT



HYDRAULIC CYLINDER LIFT



HYDRAULIC LEVER LIFT



MOTOR LIFT



MOTOR LIFT

This causes the control valve to close and pressure is thereby maintained in the cylinder; simultaneously the pressure valve opens to allow the exhaust gas from the engine to escape in the normal way. The cultivator is now raised to full height and will remain there until the control lever is pushed forward to open the control valve and release the gas in the cylinder. As some cultivators are heavier than others, the automatic release is fitted with an adjustment so that the pressure at which it will release can be set as required. Pneumatic lifts are obtainable for three models of row crop tractors rated at about 17 horsepower on the drawbar and as such would be used with tool bars fitted to work from one to six rows of crop and having a maximum width of about 7ft. Although not shown in the diagram of the tractor fitted with the pneumatic lift in Fig. 9, a rear tool bar can be used to remove the wheel marks, and it can be connected with the pneumatic lift by a suitable mechanism.

Hydraulic Cylinder Lift

The use of the hydraulic principle to raise the tool bar of the tractor cultivator is just one of its applications to give easier and lighter operation of farm implements. In the form illustrated in Fig. 9 a gear pump centrally located in the tractor and driven from the front end of the power take-off shaft delivers oil from a reservoir through hoses to the cylinders. The base of the cylinders is pivotally mounted on the horizontal push rods, and the piston rod is fitted to a depth adjustment lever near the driver's seat. By locking this lever in the various positions provided on the quadrant the depth of cultivation is regulated. The push from the hydraulic cylinder is taken through a simple system of levers, lift rods, and pressure springs to the gang beams. The cultivation tools may be attached directly to the gang beams, or a tool bar may be fitted below the gang beams, to carry them. The arrangement used will depend on the crop, row spacing, and soil conditions.

If hoses are taken from the pump to a cylinder on either side of the tractor, a linkage can be arranged so that all gangs are lifted simultaneously. The two cylinders can also be made to act selectively so that either side of the cultivator can be raised independently. This is very useful when cultivating odd rows against a field road, as the tools not in use would be damaged by the hard road surface unless raised clear by the selective lift.

When a third cylinder specially fitted with a delayed-action valve is connected to the rear lifting system

TRACTOR INTER-ROW CULTIVATORS



[Sparrow Industrial Pictures Ltd. photo.]

A parallel type tool bar fitted with rigid knife weeders. The weeders are staggered across the bar to provide clearance between their trailing edges.

the rear gang is lifted and lowered after the front gang. This means that when the tractor is emerging from a row the front gang is lifted by pulling the control lever, but the rear gang continues to cultivate up to the point where the front gang was lifted before it is raised. Similarly, when a new row is entered after turning the tractor the front gang is lowered at the start of the row. The tractor moves forward and the rear gang is not lowered until it reaches the point where the front gang commenced cultivating. This is all put in motion by one pull or push of the control lever and the delayed action is brought about by the special valve fitted to the third cylinder. Another feature of the hydraulic lift is that it allows the cultivator to be raised a little when the going becomes too heavy for the tractor in a damp or sandy spot; the traction is reduced by pulling the control lever a little and then releasing it. The cultivator can later be lowered to its normal depth by depressing the control lever to its full extent. This can be done while the tractor is in motion so that there is no delay or lost time. This lifting unit is versatile in its action and greatly facilitates inter-row cultivation.

Hydraulic Lever Lift

In the hydraulic lever lift the hydraulic principle is also employed, but only one piston is used. The lifting

unit is at the rear of the transmission housing. A gear pump driven from the power take-off shaft forces oil from a reservoir into the cylinder to create pressure against the piston. The piston is connected by a system of levers to a rock shaft which has two arms fitted to it externally. The thrust from the arms is transmitted through a system of levers to the front tool bar and through a bell crank and chain to the rear tool bar. The cultivator is raised by the hydraulic lift, and when the lift is tripped the weight of the cultivator as it is lowered forces the piston back, causing the oil to flow back to the reservoir and by-pass the gear pump on the way.

A throttle valve is provided to regulate the flow of oil from the cylinder when the lift is tripped, and thus the rate of fall of the cultivator is governed. When the lift is not in action the gear pump continues to operate, but the oil is by-passed from the cylinder and circulates back to the reservoir.

The hand lever controls only the depth of the front gang, which is still free to follow the contours of the ground by means of a pressure spring and set collars on the lift rod. The working depth of the rear gang is controlled by a depth wheel and is varied by altering the length of the standard of the wheel. Parallel bars have also been used to connect the tool bars to the tractor to ensure that they are always parallel to the ground.

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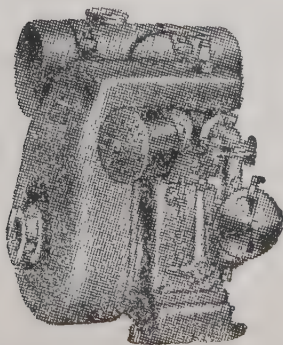
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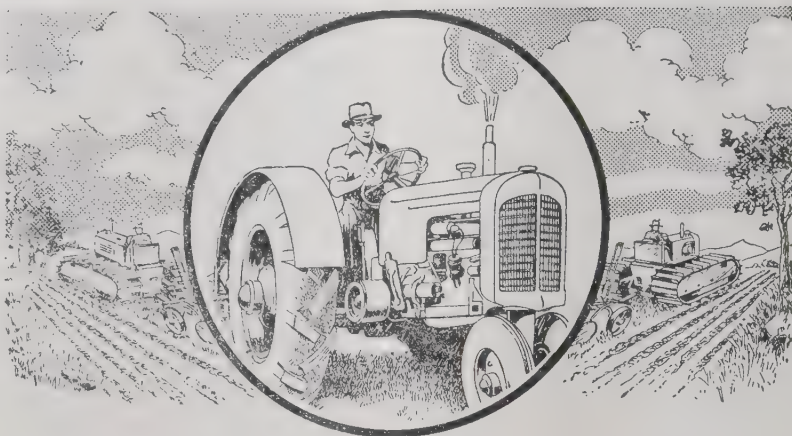


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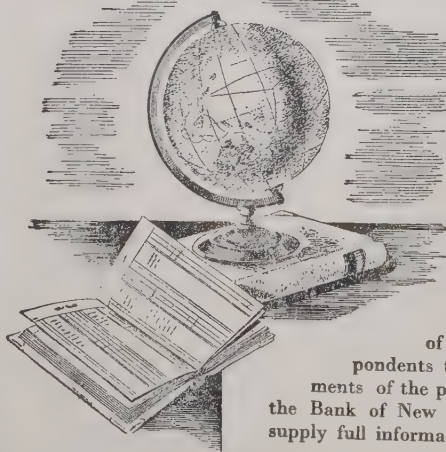


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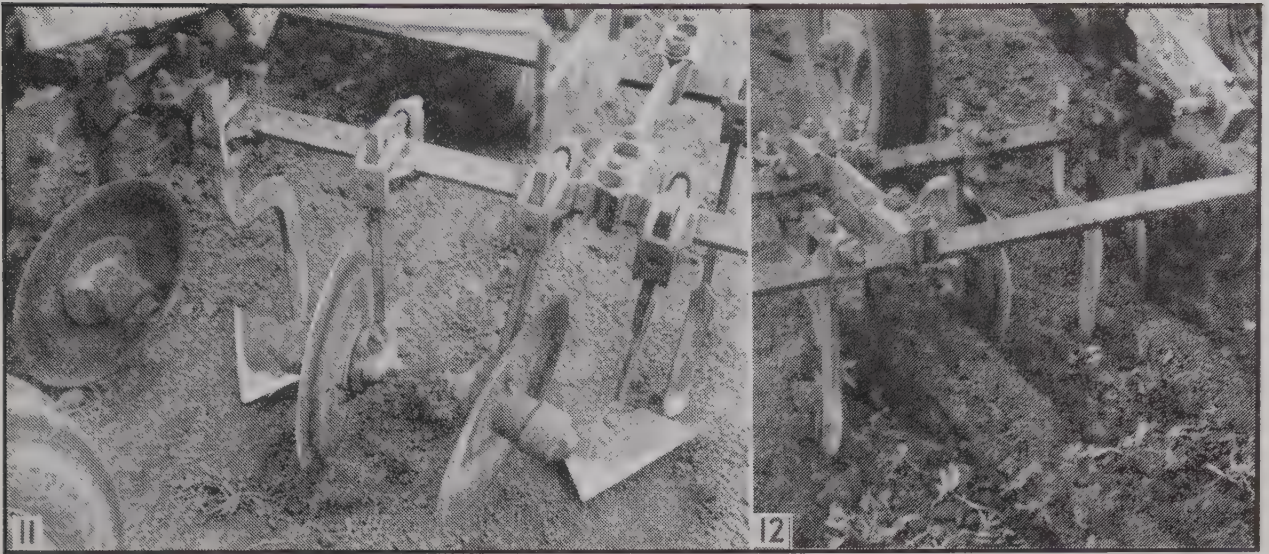
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TRACTOR INTER-ROW CULTIVATORS



[Sparrow Industrial Pictures Ltd. photos.]

Left—Disc weeders and duckfeet used together give a cultivation unit that is particularly useful for weeding close up to rows of young plants. Right—The duckfeet move soil back into the furrows left by the disc weeders. The weeds are left on the surface to wither in the sunlight.

Three-point Linkage

Publicity was given recently to a new tractor incorporating "entirely new principles" in the linkage between tractor and implement. The cultivator used with this tractor is of type B in Fig. 4 and is linked behind the tractor with two lower rods that pull the tool bar and a third rod above the other two that pushes back and so prevents the tool bar from tipping forward.

This is claimed to be a new principle, but reference to Fig. 9 will show that parallel links are used in at least four other types of inter-row cultivators. In these the lower link or gang beam is of heavy construction and does the actual pulling, and the lighter top link is in compression and prevents the tool bar from tipping forward. The new system uses only one central top link in place of the two used previously, but the principle is still the same.

An improvement has been made, however, in providing ball-and-socket joints in the links, and pin connections between the links and the implement to be attached to the tractor. A major feature of this system is a master control spring which, fitted at the base of the top link, allows excess compression to be transmitted to a control valve in the hydraulic lift, the cultivator thus being automatically lifted sufficiently to reduce the draught and lowered again when the compression of the top link is reduced. Another feature is that the cultivator may be tilted by turning a crank operating a small bevel gear and worm fitted in one of the lift rods to

lengthen or shorten the rod. This is of advantage when it is desired that times next to trees run shallow, as when cultivating in orchards, while those away from the trees run at normal depth.

Motor Lifts

In the motor lift power is taken directly from the power take-off shaft to the lift through a worm and gear. A ratchet type of clutch and convenient foot trip engage and disengage the lift at any time. The two motor lifts illustrated in Fig. 9 differ in the linkage between lift and the tool bars and in the position where the lift is housed. In the first the lift is taken by a lever to a bell crank and through a spring-cushioned lift rod to the rear gang beam, from which it is transmitted directly to the rear tool bar and through a system of levers and a crank to the front tool bar. The depth adjustment lever is illustrated in outline only, as it is too complicated to be shown in detail.

In the second motor lift a link connects the lift arm to a rear rock shaft from which a lift rod is attached to the rear tool bar, and a system of levers transmits the thrust to the front gangs. The depth-adjusting mechanism of this lift is also too complicated to be illustrated fully.

A power lift makes for easier and faster cultivation and, in fact, may be regarded as indispensable to the heavier multi-row units. One may perhaps hesitate before purchasing a power lift because of the extra capital outlay, but it should be remembered that the majority of firms provide a

versatile lift that can be used with other implements. It is becoming common practice overseas to fit power lifts to such implements as integral ploughs, both mouldboard and disc, discs, tip trailers, tractor scrapers, scoops, loaders, post-hole borers, planters, weeders, integral crosscut saw benches, disc terracers, hay sweeps, and mowers. The initial outlay for a power lift can therefore be regarded as being spread over most of the machinery on the farm.

Its use with farm implements can be appreciated only when the operator has used one and realised how a lift takes much of the drudgery out of tractor work.

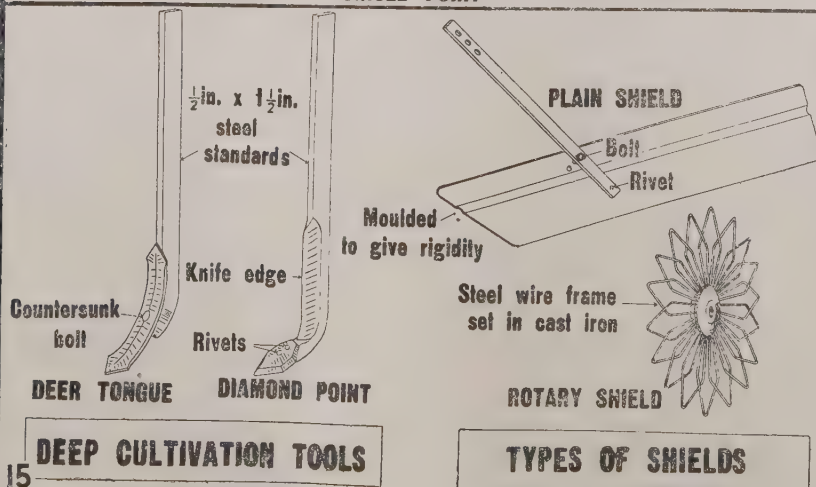
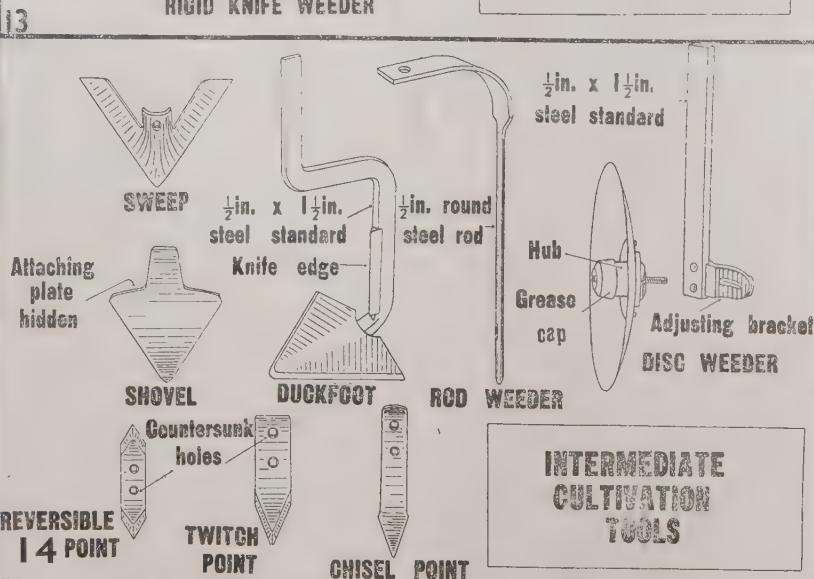
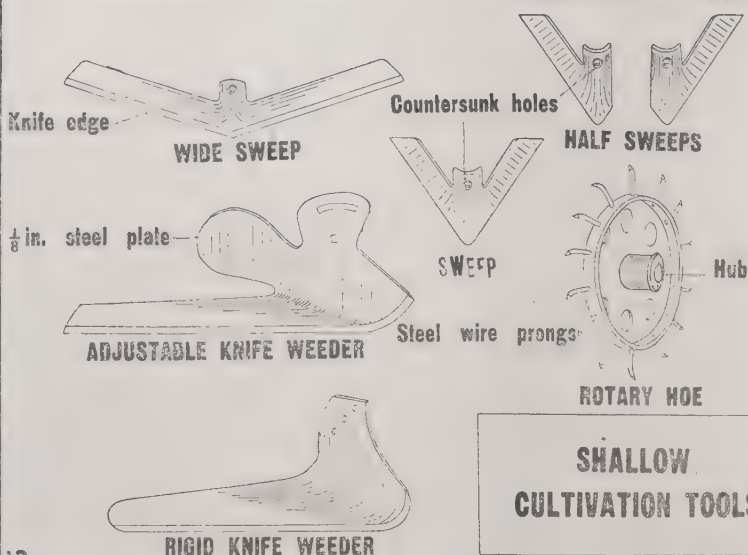
TOOL BAR ATTACHMENTS

A wide variety of tools are available for cultivation and weeding and may be broadly classified according to whether they are required for: (i) weeding and shallow cultivation; (ii) intermediate cultivation; or (iii) deep cultivation. This classification, however, is not rigid, for some intermediate cultivation tools may be used in combination with others for either shallow or deep cultivation.

Shallow Cultivation Tools

Shallow cultivation tools are used when it is desired to cultivate and weed close up to the rows of plants. It will be found in many cases that a combination of tools is used more often to obtain a desired effect than a tool bar fitted with all one type. Shallow cultivation is carried out mainly with sweeps (see Fig. 13), which are obtainable in a variety of sizes accord-

TRACTOR INTER-ROW CULTIVATORS



ing to the crop, the row spacings, and the nature of the soil. Half sweeps are used for cultivating close up to the rows, but they are not generally used until the crop is well grown and there is little danger of smothering the plants with the soil thrown up by the tool.

Special tools have been developed to carry out the weeding associated with shallow cultivation. Instead of using several sweeps to obtain a complete coverage of the inter-rows, wide sweeps have been developed. They are flatter than the ordinary type and may be up to 12 in. wide. As the blades are nearly horizontal, there is little lateral movement of the soil, and the weeds are cut off and left in about the same position in which they were growing.

Knife weeders are used to facilitate the weeding of stands of young plants. They may be either left- or right-handed according to the side of the row on which they are used. The knife edge of the blade makes an angle of about 30 degrees with the direction of travel, and the vertical portion of the knife weeder prevents any soil or dust falling on the young plants and so obviates the use of shields. The weeders are used in pairs, one on either side of the row, and, depending on the spacing of rows, their trailing edges may overlap to give a complete coverage of the inter-row, or if they do not meet, a duck-foot or sweep may be fitted behind them to give the necessary coverage. When the trailing edges overlap it is customary to stagger the tools across the tool bar so that they are clamped alternately in front of and behind the bar (see Fig. 10). This ensures that there is a space between the trailing edges and facilitates clearance of weeds. The adjustable knife weeder shown in Fig. 13 has an advantage over the rigid type in that the blade may be tipped up or down to suit special conditions; for example, to facilitate the entry of the cutting edge into hard soil which has dried out after compaction by heavy rain, or to provide for better cutting of the more fibrous-rooted types of weeds. As the weeder is bolted to a cone which clamps around a circular portion of the standard, the angle of the blade to the direction of travel can also be altered to suit the prevailing conditions.

The rotary hoe or rotary weeder is a tool especially adapted for weeding when both plants and weeds are small. It is available in several forms, but consists essentially of a number of curved tines set about a central hub which revolves on an axle. The tines are curved in such a manner that as they enter and leave the soil the points curve up and under the roots of the weed, which is lifted out when the tine emerges. Three or four rotary weeders may be combined to make a unit which travels right over the

planted rows, working in and round young plants, stirring the soil into a fine mulch, and killing weeds.

When plants are very young disc weeders are used more often, for there is no shower of dust from them in the direction of the plant. These disc weeders, which are about 12in. in diameter, revolve on a stub axle, the block end of which is bolted to an adjusting bracket on the standard (see Fig. 14) so that the "bite" of the weeder can be altered to suit any conditions. In another type the stub axle is fixed rigidly to the standard, which is circular in cross-section and can be rotated in the clamp by which it is fixed to the tool bar. By this means it is possible to alter the "bite" of the weeder. Because disc weeders leave a small furrow along the row the small plants are left on a ridge, and to prevent the tendency of the ridge to dry out, a duckfoot or a fairly-wide sweep is fitted behind the disc weeder to move soil back into the furrow (see Figs. 11 and 12).

Intermediate Cultivation Tools

As the crop grows the leaves become more numerous and spread out over the inter-rows, and weed seeds no longer germinate close into the plants because of the lack of sunlight. As a result it is not necessary to weed close up to the plant and carry out shallow cultivation, and the tools can be set further from the plants, deeper in the soil, and can work at higher speeds.

The sweep in its variety of sizes is admirably suited for intermediate cultivation in that its blades are set at an angle of about 30 degrees to the horizontal and when it is mounted on a spring-trip standard the pitch of the sweep can be altered to allow easy penetration of the soil. The pitch of the sweep is important, for if it is set too flat, the shank of the standard may interfere with the penetration, and if it is set too straight, it will require considerable pressure to make it penetrate and there will be a tendency for it to skip and jump. For average working conditions a line drawn from the point of the shovel or sweep to the top of it should make an angle of 47 degrees with ground level.

The shape of the shovel makes it a good tool for cultivation to intermediate depths and it is used with a standard that allows the pitch of the tool to be altered.

The duckfoot, being flatter, is more of a weeder than a cultivator, but does both jobs, as does the sweep. The duckfoot, because of its depth of blade, is riveted to a special standard so that the point of the blade is just forward of the point of attachment of the standard to the tool bar. The duckfoot is used in conjunction with knife weeders when the plants are small, but can be used as both a cultivator and

... TRACTOR INTER-ROW CULTIVATORS

weeder at greater depths as the crop grows.

Rod weeders are used in gangs made up of two or more rows of rods spaced up to 6in. apart, the rods being staggered so that a complete coverage is obtained. The rods may be welded to a strap of spring steel as shown in Fig. 14, or may be welded to a coil spring, but they must be free to move laterally as they move through the soil, for it is this characteristic of the rod weeder that enables it to destroy weeds without injuring the crop plants. They are used mainly on strong-growing crops such as transplanted cabbage or potatoes before the crop has been moulded up. As they zig-zag through the soil the rods tear out the roots of the smaller weeds while those working along the rows of the plants move around the stronger-growing crop plants to displace and pull out the weeds. The rod weeder is particularly effective in breaking up soil crusts formed after heavy rain. One or more gangs can be fitted to the tractor to make a wide implement capable of covering many acres in a day (see Fig. 17). This type of rod weeder should not be confused with the rod weeder that uses a supported, revolving square rod up to 18ft. long to weed areas in fallow.

The disc weeder can be used until the plants are fairly big and can be adjusted to work at intermediate depths. As in shallow work, it should be used in conjunction with other tools that will move soil back into the furrow that it leaves. Disc weeders are of special use for weeds that are of a trailing nature, for they cut the vines that have run between the plants, whereas other tools would be-

come entangled in them and possibly pull out some of the crop.

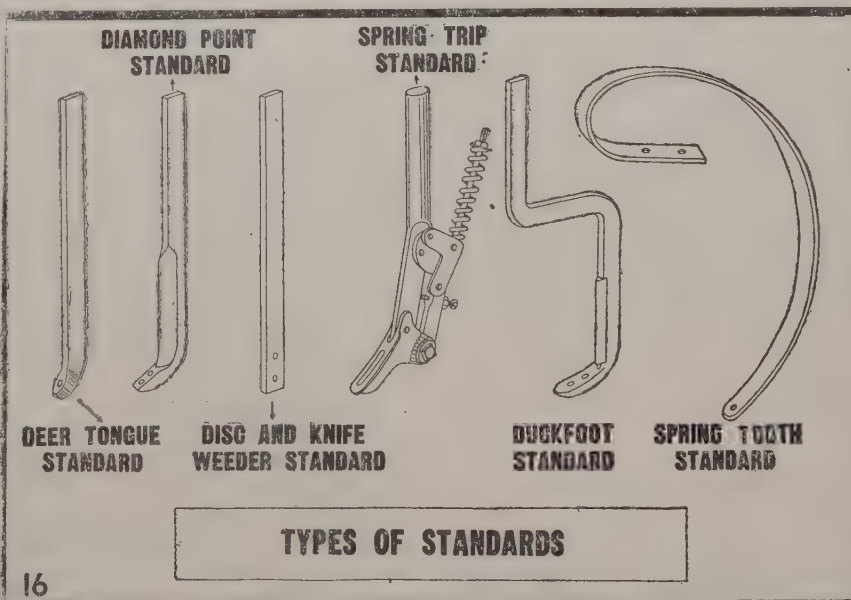
A variety of tools of a chisel nature are also used for cultivation to intermediate depths. They are available in a wide range of sizes and may be either singly or reversibly pointed and may be used on either spring standards or on standards of the rigid type. These tools are used more for cultivation than for weeding, although some are adapted for special work, such as the twitch point, which is used to bring twitch roots up to the surface.

Deep Cultivation Tools

Deep cultivation is carried out with the deer tongue and the diamond point. These two tools are sturdy in construction and the narrow blades fitted to them are moulded so that minimum traction is required to cultivate with them, and their shape makes for easy penetration of the soil to the required depth. They are useful for general loosening of the soil before moulding up such crops as potatoes, cabbage, and cauliflower. They may be used for deep cultivation of inter-rows, but should be used for that work only after a study has been made of the rooting habit of the crop. A crop which roots profusely in the upper and intermediate layers of the soil, such as maize, would suffer considerably from the use of such tools, but deep-rooting crops such as cabbage and sugar beet may be deeply cultivated to advantage.

Types of Standards

The deer tongue, diamond point, and duckfoot standards (see Fig. 16) have all been designed for a specific tool and are not interchangeable. The disc and knife weeder standard can be



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TRACTOR INTER-ROW CULTIVATORS

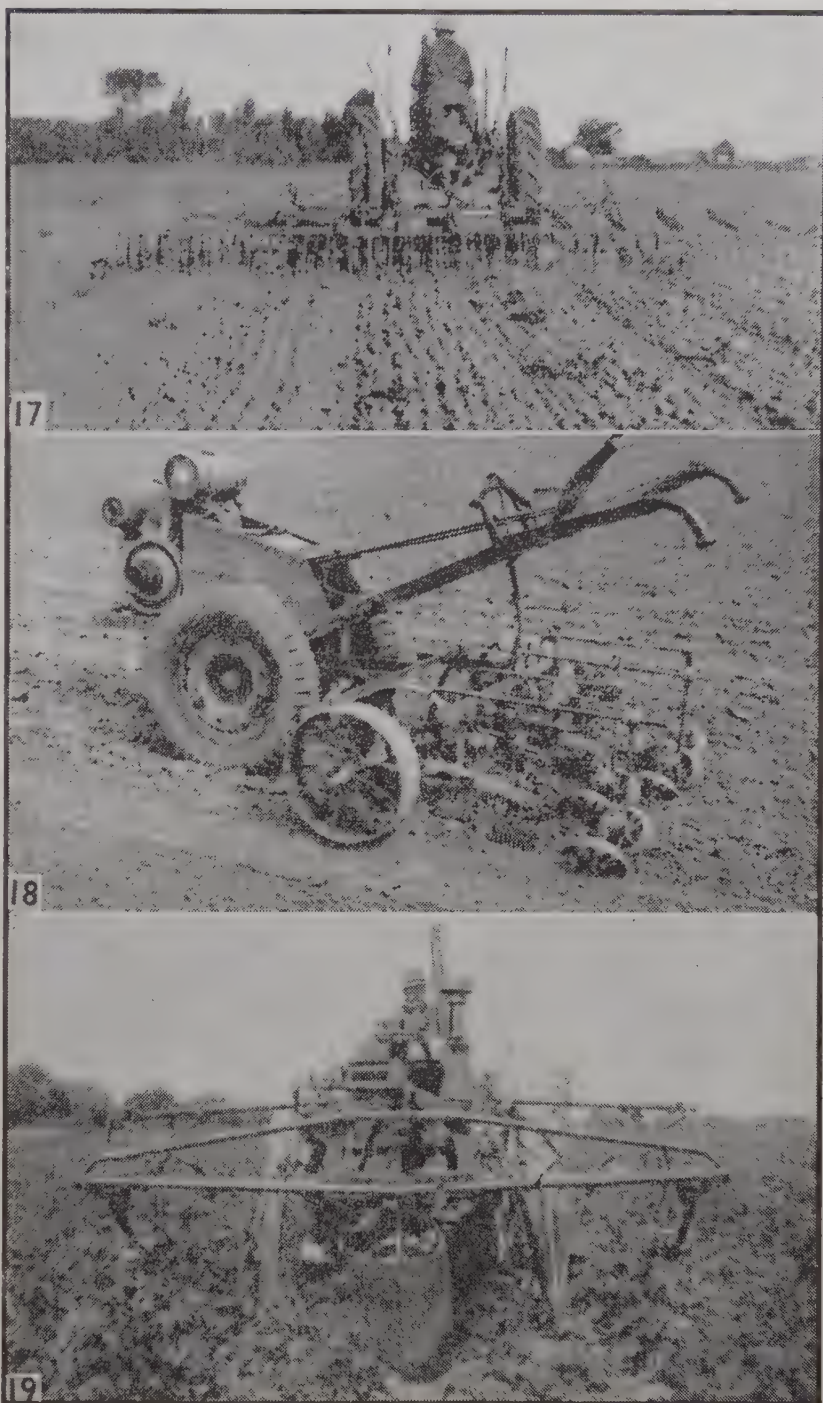
fitted with either a rigid knife weeder or an adjusting bracket to take a disc weeder (see Figs. 13 and 14). A special standard (not illustrated) which has a rounded portion fitting into a sleeve which can be rotated is used to alter the angle of cut of the adjustable knife weeder. The blade can also be tipped up or down by slackening two bolts which attach it to the sleeve.

The spring-trip standard (see Fig. 16) has been designed to prevent breakages of tools and bending of standards when working in hard soil or stony ground. When the tool strikes a rock or root the slotted shank pivots on a flat-headed pin and the tool rides over the obstruction and is returned to normal working position by the compression spring. The force necessary to trip this standard is adjusted for average working conditions at the factory and should not be altered unless exceptional conditions are experienced. It is important to keep the joints oiled and free of rust, otherwise their functions will be impaired. The slotted shank is adjustably fitted to the adjusting bar so that the angle of the tool attached may be altered if necessary.

Two other types of cultivator trips are available—the break-pin trip and the friction trip. The break-pin trip has a wooden pin passing through both shank and standard and when an obstruction is met the pin is sheared off before the tool is damaged. In the friction trip system the standard is clamped to a plate held in close contact with another by a bolt. When an obstruction exerts undue force on the standard it simply rotates backward on the friction plate and bolt and thus prevents damage to the cultivator. Both types of trip suffer from the disadvantage that after they break the operator has to dismount to right them, whereas the spring trip automatically returns to normal working position.

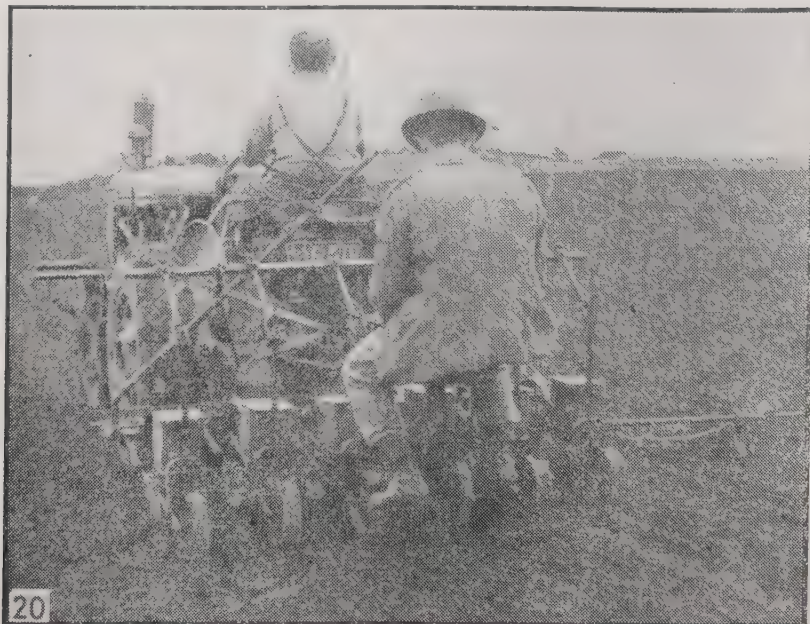
The straight, round standard shown fitted to the spring trip in Fig. 16 can be replaced if necessary with a standard that is offset 2 in. either to the left or right. These offset spring-trip standards are occasionally useful to place a tool in a position that is difficult because of the design of the tool bar. They are useful also for cultivating close to the roots of bushy plants. The spring-trip standard can be fitted with any of the different sizes of sweeps, shovels, or reversible points and is therefore a widely-used unit that should be included in the attachments of every inter-row cultivator.

Although the spring-tooth standard shown in Fig. 16 is the most commonly used of its type, it is available in a variety of forms that differ according to the type of clamp used and with the work it is expected to perform. It is a good standard for use with reversible points for general cultivation and aeration. A slotted block is avail-



Upper—Six gangs of rod weeders working eight rows of crop. The weeder break up the soil and at the same time kill young weeds. Middle—A four-row weeder fitted with sets of four combs which rotate and kill weeds growing between the plants in the row. The trailing wheels move soil back over the tender tips of the growing crop to protect them. Lower—A four-row cultivation unit moulding up a 30-acre crop of potatoes. Wheel shields have been fitted to prevent damage to the haulms. The machine is eight years old, but still works efficiently.

TRACTOR INTER-ROW CULTIVATORS



[Sparrow Industrial Pictures Ltd. photo.]
The six-row planter is a unit that ensures accuracy of row spacing and makes for easy cultivation when the crop grows. The outrigger marker provides a guide mark for the return trip.

able for fitting between the standard and the tool so that the angle of the tool may be adjusted.

Stiff-tine standards may also be fitted with a spring trip at their point of attachment to the tool bar, and their action in the soil is very similar to that of the spring-tooth standard. Furthermore, if an obstruction is met while cultivating, the spring trip allows the standard to rotate back until it is clear, thereby preventing damage to the tool.

With such a wide variety of standards available, a selection may be made to provide for any class of cultivation.

Cultivation Between Plants

Mechanical cultivation tools are all used to cultivate the inter-rows, and weeds are left growing in a narrow band between the crop plants in the rows. These weeds have been a big problem in the past and have usually been removed by hand labour, but recently machines have been developed to remove them. One tool, which is automatic in action, consists of a revolving axle drawn parallel to the row. Several steel-spring tines are mounted on the axle and as it revolves the tines flick out the weeds between the crop plants and also loosen the soil. The tines are wound in a coil spring at their point of attachment to the axle and as a result bend back when passing crop plants, but flick forward when

the plant is passed, removing any weed which may be growing between the plants.

Another type working on a similar principle is shown in Fig. 18, and consists of four combs which are mounted on and spring-loaded to a revolving axle which is drawn forward directly above the row to be weeded. The four-row weeder shown is drawn by a small two-wheeled garden tractor and is being used to weed rows of onions planted 2in. deep with soil moulded above the rows to a height of 2in. By the time the onion seed has germinated and the shoots grown to 1 to 1½in. high the weed seeds have also germinated. At this stage the four-row weeder is used and the combs as they revolve shift the ridge of soil (and the weeds growing on it) to the right and scatter it over the inter-rows. The tips of the young onion plants are left exposed, and to prevent damage by cold winds or the sudden emergence into sunlight two ridging wheels drawn behind the weeder move in just sufficient soil to cover the tips. The plants are now free to emerge into a row that has been cleared and the crop will be free from weeds between the plants. The seeding rate is adjusted to provide for the small percentage of plants removed by the revolving combs. After the crop has emerged from the soil and the rows can be clearly seen the weeds growing in the inter-rows are destroyed in the usual way.

A third machine, which is manually operated, has been developed to remove weeds growing between the plants in the rows. It consists of two knives which are lever operated. Raising or lowering the lever controls the depth of the knives and a twist grip on the lever handle allows the knives to be moved apart when passing a plant or brought together to remove the weeds between the plants. These units, up to four in number, are mounted on a frame on wheels and are drawn behind a tractor. Although each unit does only one row and needs one operator a unit, the man hours required to weed a crop by this means compare favourably with the older method of weeding with hand hoes.

Shields

Some tools, particularly shovels, some types of sweeps, and some of the reversible points, have a tendency to shower dust and fine soil over the rows of young plants, resulting in blockage of the breathing pores in the leaves and a consequent retarding of growth or possibly the death of delicate plants like tomatoes. Some small plants may be completely covered and this often happens when cultivation is carried out at high speed or if care is not taken by the operator. There is also danger of damage from flying clods if the soil has not been worked down fine enough.

To protect the tender young plants from such damage shields are used. They are attached to the tool bar in such a position that they hang between the rows of plants and the tools working in the inter-row and they are usually mounted so that they are free to follow the contours of the ground.

Plain shields of the type illustrated in Fig. 15 are quite efficient and have the advantage that a pair of them can be used until the plants are quite large without damage to the growing tip. Another type of plain shield consists of a vertical standard to which is fixed several horizontal steel rods which give the plant protection from clods, but allow the finer particles to sift in around the roots. A third type has the shape of a hood and completely covers the young plants, but it can be used only to a certain stage without damaging the growing plant. However, it does afford complete protection when the plants are small. A fourth type is the rotary shield illustrated in Fig. 15. It may appear that the shield would allow soil to spray off the tool and on to the plants, but as it is in contact with the ground, the forward motion of the tractor causes it to revolve and it becomes in effect a rolling disc that stops the clods, but allows the fine soil to sift in around the plants. This shield has the added advantage that it rolls over the ground and does not drag weeds

and rubbish with it. Like the plain shields, the rotary shield is used in pairs, one on either side of the row, and may be used until late in the life of the plant.

Shields need not be used with knife weeders of the type illustrated in Fig. 13, nor with a gang of rod weeders which are designed to weed between the plants in the rows.

Moulding Tools

Moulding up such crops as potatoes and cabbage is an operation of tractor tool bars that is probably most widely known in New Zealand, for it has been carried out for a number of years. The rigid type of moulder is better known, the moulder with adjustable wings having been introduced only during the war. The adjustable type gives better results if the operator takes care to adjust the wings to the speed of the tractor and to the soil conditions at the time of the operation. Fig. 19 shows a tractor that is fitted for moulding up potatoes at an advanced stage of growth. It will be noted that shields have been fitted in front of the tractor wheels to lift the haulms and so prevent the wheels crushing them. Moulding can also be carried out by using disc hillers, which are very similar to the disc weeder illustrated in Fig. 14. The angle of cut of the disc hiller is varied at the adjusting bracket on the standard and may be altered according to the amount of soil it is desired to throw up to form the ridge. Moulding can be carried out more efficiently if the ground is first cultivated deeply with the deer tongue, diamond point, or with chisel points mounted on spring standards.

Ridging and Splitting Back

On soil of a damper nature it is sometimes desirable to throw up ridges before planting out or before sowing, and heavy tools of a special nature have been developed for this purpose. They are somewhat similar to the rigid type of moulder, but are more strongly constructed and are mounted on heavy standards usually fixed to a tool bar located behind the tractor. Up to three ridging bodies may be fitted, depending on the size of the tractor used. When it is desired to leave the field to weather in ridges during the winter the ridges are thrown up in the autumn, and before planting they are split back by running the tractor wheels along the top of the ridges, new ridges being formed in what were previously the furrows.

Steering Attachments and Fins

When a crop is being cultivated it often happens that, owing to a curve in the rows or to a momentary slackness on the part of the operator, the tools cultivate very close to the rows with the risk of lifting out the crop

... TRACTOR INTER-ROW CULTIVATORS

plants. When the cultivation is being carried out with a tool bar fitted between the tractor wheels (see type A, Fig. 4) it is a simple operation to steer the tractor and the tool bar back into the centre of the inter-rows. However, if the tool bar is fitted behind the tractor, it is not as easy to rectify the trouble; if the front of the tractor is swung out into the centre of the inter-row in the normal way, the tool bar swings in the opposite direction and the tools destroy several plants before the unit is back in its right position. Therefore this type of tool bar is generally fitted with a steering mechanism that enables it to be shifted without moving the tractor.

A cultivator of local manufacture (see Fig. 8) has the tool bar fitted so that it can be operated by lever from the driver's seat to give a lateral adjustment of 6in., which will enable the bar to be moved away from the plants should the tractor work too close to the row. A similar arrangement is used on another type (see adjustable tool bar, Fig. 4), but the lever is operated by a second man seated behind the tool bar. It is difficult, however, to justify the use of a second labour unit for tractor inter-row cultivation of this type, especially when by altering the location of the control lever the job can be done by the tractor driver. Another type of tool bar fitted behind the tractor has a steering fin which works in the inter-row in front of the tool bar. If the tractor is allowed to get too close to the crop, it is steered to the centre again by moving the front wheels. This moves the tool bar in the opposite direction and a pressure is set up against the side of the

fin which then aligns itself with the front wheels. As the tractor moves back to the centre of the inter-row the fin steers the tool bar away from the row. For weedy ground a rolling fin can be used. This is fitted to the tractor with a flexible linkage system that embodies ball-and-socket joints so that lateral movement of the tool bar can be easily obtained by use of a fin.

Tool bars of type A in Fig. 4 are sometimes fitted with a steering mechanism which is actuated by a lever clamped to the vertical steering column of the tractor; when the tractor is steered away from the row the tool bar is also moved out into the inter-row.

However, the benefit obtained from the use of this steering device hardly warrants the price of it, as tool bars between the tractor wheels are moved away from the row when the tractor is steered away. A tractor pivots to some extent on its back wheels, so that lateral movement of the front is accompanied by lateral movement of the tool bar suspended between the wheels. Lateral movement, of course, is speeded up by the use of a steering mechanism for this type of tool bar.

Seeding Attachments

In addition to its use for cultivation and weeding, the tool bar can be fitted with seeding attachments or planters.

A wide variety of seeders are available and can be used to plant most crops. They are generally mounted as complete units on the tool bar, the number of units varying with the tractor power available or with the number of rows it is desired to plant within the width of the tool bar. Each



These four rows of onions were sown on 13in. centres, each block of four rows being 20in. apart so that the rows could safely take the tractor wheels, which are 60in. apart. This is more suitable for tractor cultivation than planting all four rows at 15in. centres.

TRACTOR INTER-ROW CULTIVATORS



[Sparrow Industrial Pictures Ltd. photo.]
Fertiliser being applied in four bands. Seed is being sown below the fertiliser by the planters fitted behind the tractor.

unit consists of a wheel which, by contact with the ground, provides the power necessary to drive the feeding mechanism, a seed hopper mounted over a furrow opener, and a covering device which moves soil back over the seed to be compressed by a curved-rim wheel which follows behind. Each unit is free to follow the contours of the ground, but is prevented from skipping or jumping by a compression spring on the lifting rod (see Fig. 20). Spacing rods hold the units in line and ensure accurate row spacings. When the units are lifted at the end of the rows the driving wheel loses contact with the ground and the feed mechanism is put out of gear. Out-rigger markers are used with this equipment to make a line which the tractor driver follows for succeeding rows.

Some seeders are equipped to distribute fertiliser when sowing seed. The seed and fertiliser bins are mounted over the furrow opener, the fertiliser being fed down a separate tube from that of the seed to a special shoe by which it may be placed above or below the seed or in one or two bands at the side of the seed. The planters can be obtained in different types to sow the seeds continuously, in bands, or at accurate regular spacings of any desired length, and the number of seeds dropped at any one spot can be regulated. Another type known as the check row planter is designed to plant at regular intervals along the row and to plant seeds in rows across the field so that the crop may be cross-cultivated to remove weeds growing between the plants. The feeding mechanisms of these larger units are actuated by a cog-and-chain drive from the rear wheel of the tractor.

Fertiliser Attachments

Fertiliser attachments can be used to apply a side dressing after the

plants are established and for this purpose are used with cultivation tools. The bins usually have star feeds which distribute the fertiliser down through two tubes tied behind a pair of sweeps or knife weeders working on either side of the row (see Fig. 24). These units may also be used to drill fertiliser when the seed is sown by a planter. The fertiliser may be applied to the top of the soil and the seed sown under it, or the band of fertiliser may be covered by throwing up a ridge with disc coulters and the seed sown in the ridge above it. The fertiliser bins are mounted above the tool bar which is slung between the tractor wheels, the planter being fitted to the rear tool bar as shown in Fig. 22. It is also possible to have both units mounted between the tractor wheels so that both operations are carried out within full view of the tractor driver, and any blockage of seed or fertiliser can be seen and cleared. The bins have a control lever

to regulate the flow of fertiliser, and by the use of this lever and by changing the cogs in the chain drive from the rear wheel it is possible to regulate the flow for a wide range of application rates.

The fertiliser attachment can also be used to prepare ground for transplanting such crops as cabbage by distributing fertiliser in bands as the moulders or disc coulters on the tool bar throw up a ridge.

Harvesting Attachments

Attachments are available for harvesting a limited number of crops. In overseas countries where large areas of beans are grown special knives are fitted to the tool bar. They cut off the plant at ground level and turning rods move two rows into one, thus reducing costs.

An attachment that has been used in New Zealand with marked success is the onion harvester. It consists of a vertical, power-driven axle mounted above the row of onions. At the lower end of the axle is mounted a convex circular plate with several radial slots in it. The plate moves through the soil just below the onions and as it rotates it lifts them out to windrow with those delivered from the adjacent row by another plate. The radial slots remove the soil from the onion roots with practically no damage to the bulb.

Manufacturers have spared no efforts to produce a large variety of attachments for the tool bar. These attachments enable almost any phase of inter-cultivation, seeding, fertilising, and to some extent harvesting to be carried out with a wide range of crops, whatever the type of soil in which the crop grows. The grower can therefore make a selection of tools to suit his own conditions.

INTER-ROW CULTIVATION

The aim of inter-cultivation and weeding is fully covered in an article



A useful four-row planter and fertiliser attachment fitted to a two-wheeled tractor, a unit which works satisfactorily with a variety of crops.

by J. R. Murray on page 446 of the November, 1946, issue of "The New Zealand Journal of Agriculture." He points out the advantages of these operations, but emphasises that there is **no advantage in inter-cultivation in the absence of weeds.**

Inter-row cultivation cannot be carried out successfully unless full provision is made for it right from the start. The ground to be worked should be free of stumps, and any large stones should be removed. Planting must be done in accordance with the size of the cultivator on hand. If it is a two-row machine, plant two rows at a time or any multiple of two; if a four-row unit, plant four or eight rows at a time; and if a six-row machine, plant six rows. A crop planted in single rows cannot be cultivated successfully with a tractor-mounted unit unless extreme care has been exercised in the row spacings. The possible exception is potatoes, as moulding up kills the weeds and does away with the close cultivation so necessary for some crops.

Planting in Narrow Rows

When it is desired to plant in narrow rows, say 10, 12, or 14 in. apart; it is advisable to plant in blocks that can be straddled by the tractor, each block being spaced from the next by a distance that will conveniently take the tractor wheels. This is illustrated in Fig. 4, where the parallel tool bar is shown working four narrow rows and the single tool bar is shown working six rows. Fig. 21 shows an example of planting to suit the inter-row cultivator.

For all row crop tractors it is advisable to follow the manufacturer's recommendations given in the operator's manual issued with each machine. These instructions are the result of years of experimental work in the field and can be followed with full confidence. It may be argued that they are based on overseas farming practices that differ from those in New Zealand, but it should be realised that the modern row crop tractor with adjustable front and rear wheels can be rigged to track in any of the row spacings used in normal practice.

Practice in Field Essential

The technique of inter-row cultivation can be acquired only through actual practice in the field, where the operator can get to know his machine and learn its capabilities. The setting of the various tools, the time and place to trip the lifting mechanism, the pressure to put on the wheel brake when turning so that the tractor will turn and line up in the correct row for the next run, when to lift the tool bar to make the load a little easier in hard going, and the speed at which a given operation can be carried out

TRACTOR INTER-ROW CULTIVATORS



[Sparrow Industrial Pictures Ltd. photo.]
A side dressing of fertiliser, which is beneficial to some crops, can be applied by this fertiliser attachment while weeding is being carried out.

are all points on which no advice can be given and they must be learnt by the operator by experience in the field. He must study the crop and the soil conditions at the time of the operation and make the necessary adjustments to the machine. Inter-row cultivation can be carried out by any tractor driver who will take an intelligent interest in the work and go slow for a start. In a short time he will find that he is synchronising the various movements necessary and that the tractor can be kept moving all the time so that stopping at the ends of the rows and incorrect lining up for the start of the next trip are avoided.

Crop Thinning

An interesting operation that can be performed with a tractor-mounted tool bar is crop thinning. It is possible to set up a bar with special thinning knives and by driving across the rows to thin the crop to any desired number of plants per 100 feet of row. This is called cross-blocking or mechanical thinning and is as efficient as hand hoeing, but the man hours required per acre for thinning by the tool bar can be reduced to as much as one tenth of those necessary for hand thinning.

Another feature of the tractor tool bar that will be more fully appreciated in the future is its use for field irrigation. Tools can be fitted to make channels between the rows to take the flow of water when it is desired to irrigate the crop. New field practices have been developed under irrigated farm-

ing to allow more efficient use of the water, and the tractor-mounted inter-row cultivator plays a big part in them. Such practices as planting on wide ridges and planting at varying row spacings to give a wider inter-row to accommodate the water channel are worth consideration by the farmer who irrigates, for they can be carried out with no extra trouble with a row crop tractor and yet give increased yields.

The tractor-mounted inter-row cultivator is a machine that is versatile in its scope, does better and speedier work, and reduces costs to a minimum. Its use in New Zealand was increased a hundredfold during the war, when the Department of Agriculture extended the country's vegetable production by more than 4100 acres. In spite of a general shortage of labour throughout the country, the Services' Vegetable Production areas supplied vegetables to both local and overseas camps and much of the success of these projects was due to the high degree of mechanisation with which the work was carried out. The great work done then with tractor cultivators convinced local growers of their advantages, and at present they are being used in nearly all market-gardening districts. They are also being used more widely on farms for general crop work in potatoes, maize, turnips, and swedes, and the marked success already achieved in this field is likely to cause their use to become more extensive.

LAMBING ESTIMATES FOR 1947

Record Percentage for Dominion

By the Livestock Division

THE estimated lambing percentage of the Dominion for 1947 of 93.11 is the highest on record. This is an increase of .47 per cent. on the previous highest figure of 92.64 per cent., which was recorded for 1945. The percentage last year was 89.54.

Though the North Island percentage has increased from 87.92 in 1946 to 92.47, it is still below that for 1945, when the estimate was 92.56. The low figure in 1946 was largely caused by the severe drought which affected many North Island sheep districts. The South Island figure of 93.94 per cent. is the highest since 1944, when the percentage was 94.07.

County.	Breeding Ewes (as at 1947).	Estimated Percentage of Lambs.	Estimated Number of Lambs.
---------	--------------------------------	--------------------------------------	----------------------------------

AUCKLAND DISTRICT.

Mangonui	34,473	77.6	26,751
Whangaroa	14,424	87.2	12,578
Bay of Islands ..	62,978	88.1	55,484
Hokianga	44,296	82.3	36,456
Whangarei	89,061	87.0	77,483
Otamatea	75,198	93.5	70,310
Hobson	78,949	89.9	70,975
Rodney'	89,024	85.8	76,383
Great Barrier ..	5,951	71.2	4,237
Waitemata	73,218	92.8	67,946
Eden	2,398	97.9	2,348
Manukau	62,928	91.7	57,705
Franklin	106,879	97.9	104,635
Coromandel	35,684	73.2	26,121
Thames	9,087	84.1	7,642
Hauraki Plains ..	16,089	94.5	15,204
Ohinemuri	16,204	95.9	15,540
Waikato	154,390	99.8	154,081
Raglan	409,107	88.4	361,651
Waipa	188,469	96.5	181,873
Piako	133,499	103.6	138,305
Matamata	266,121	101.4	269,847
Rotorua	88,232	96.2	84,879
Taupo	25,402	98.3	24,970
Taumarunui	106,576	93.5	99,649
Kawhia	69,657	90.9	63,318
Otorohanga	143,094	99.0	141,663
Waitomo	349,466	88.0	307,530
Ohura	105,995	88.0	93,276
Kaitieke	67,458	94.0	63,411
Tauranga	137,600	95.0	130,720
Whakatane	45,025	90.9	40,928
Opotiki	48,217	74.0	35,681
Totals	3,155,149	92.53	2,919,580

County.	Breeding Ewes (as at 1947).	Estimated Percentage of Lambs.	Estimated Number of Lambs.
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EAST COAST-HAWKE'S BAY DISTRICT.

Matakaoa	59,276	*89.7	53,171
Waiapu	233,231	84.0	195,914
Uawa	118,621	89.0	105,573
Cook	425,708	93.0	395,908
Waikohu	339,157	84.0	284,892
Wairoa	408,278	88.0	359,285
Hawke's Bay	931,291	87.4	813,948
Waipawa	407,815	95.1	387,832
Waipukurau	138,187	95.7	132,245
Patangata	487,888	92.2	449,833
Weber	53,148	93.4	49,640
Dannevirke	275,721	95.4	263,038
Woodville	79,046	97.3	76,912
Pahiatua	155,445	91.3	141,921
Akitio	156,344	89.1	139,303
Totals	4,269,156	90.17	3,849,415

* Estimated from 1946 figure.

WEST COAST-WELLINGTON DISTRICT.

Clifton	81,955	93.6	76,710
Taranaki	27,394	99.7	27,312
Inglewood	45,473	95.3	43,336
Egmont	17,924	99.7	17,870
Stratford	101,903	93.2	94,974
Whangamomona ..	53,065	84.5	44,840
Eltham	53,217	98.8	52,578
Hawera	69,707	100.2	69,846
Waimate West ..	4,214	100.1	4,218
Patea	199,254	99.7	198,656
Waitotara	130,032	94.0	122,230
Waimarino	163,009	85.0	138,558
Wanganui	266,470	88.2	235,027
Rangitikei	957,092	97.0	928,379
Oroua	204,034	104.1	212,399
Kairanga	110,191	103.5	114,048
Kiwiotea	243,235	98.7	240,073
Pohangina	130,131	98.4	128,049
Manawatu	140,998	107.4	151,432
Horowhenua	114,433	95.6	109,398
Hutt	64,681	79.6	51,486
Makara	47,557	87.2	41,470
Featherston	332,192	89.3	296,647
Wairarapa South ..	165,214	95.0	156,953
Masterton	273,229	91.5	250,005
Castlepoint	92,060	80.4	74,016
Eketahuna	133,015	90.9	120,911
Mauriceville	49,649	88.9	44,138
Totals	4,271,328	94.71	4,045,559

LAMBING ESTIMATES FOR 1947

County.	Breeding Ewes (as at 1947).	Estimated Percentage of Lambs.	Estimated Number of Lambs.
MARLBOROUGH-NELSON-WESTLAND DISTRICT.			
Waimea	164,667	81.0	133,380
Takaka	28,193	78.0	21,991
Collingwood ..	14,180	80.0	11,344
Buller	1,474	87.0	1,282
Inangahua ..	13,595	95.7	13,010
Murchison ..	27,131	100.0	27,131
Grey	23,085	111.7	25,786
Westland ..	34,361	113.5	39,000
Sounds	97,702	74.9	73,179
Marlborough ..	195,044	85.3	166,373
Awatere	163,685	87.2	142,733
Totals	763,117	85.86	655,209

CANTERBURY-KAIKOURA DISTRICT.			
Kaikoura	126,390	80.0	101,112
Amuri	212,077	84.9	180,053
Cheviot	144,840	98.5	142,667
Waipara	286,277	97.1	277,975
Ashley	63,093	86.1	54,323
Kowai	71,190	97.2	69,197
Oxford	67,371	88.0	59,286
Rangiora	35,107	104.0	36,511
Eyre	51,601	99.0	51,085
Tawera	49,267	79.5	39,167
Malvern	124,076	89.0	110,428
Paparua	32,472	103.0	33,446
Waimairi	2,662	94.0	2,502
Heathcote	7,108	96.0	6,824
Akaroa	86,312	108.0	93,217
Mt. Herbert ..	35,863	101.0	36,222
Wairewa	70,126	107.0	75,035
Halswell	14,543	97.0	14,107
Springs	28,678	108.0	30,972
Ellesmere	71,285	104.0	74,136
Selwyn	140,967	83.5	117,707
Ashburton	708,500	91.6	648,986
Geraldine	242,192	100.8	244,130
Levels	170,966	108.4	185,327
Mackenzie	286,216	72.5	207,507
Waimate	467,820	86.9	406,536
Chatham Islands ..	46,878	73.0	34,221
Totals	3,643,877	91.46	3,332,679

OTAGO-SOUTHLAND DISTRICT.

Waitaki	454,613	90.0	409,152
Maniototo	232,580	89.0	206,996
Vincent	236,332	97.0	229,242
Waihemo	102,118	89.0	90,885
Waikouaiti	73,475	84.0	61,719
Taieri	168,489	86.0	144,901
Peninsula	17,290	95.0	16,426
Clutha	416,945	101.0	421,114
Tuapeka	336,620	89.0	299,592
Bruce	222,133	90.0	199,920
Lake	112,607	80.0	90,086
Southland	1,705,708	107.0	1,825,108
Wallace	558,789	92.0	514,086
Stewart Island ..	2,320	80.0	1,856
Totals	4,640,019	97.22	4,511,083

DISTRICT ESTIMATES.

The following table gives the estimates of the current (1947) season's lambing for each sheep district:—

District.	Breeding Ewes (as at 1947).	Estimated Percentage of Lambs.	Estimated Number of Lambs.
Auckland	3,155,149	92.53	2,919,580
East Coast-Hawke's Bay	4,269,156	90.17	3,849,415
West Coast-Welling- ton	4,271,328	94.71	4,045,559
Marlborough-Nelson- Westland	763,117	85.86	655,209
Canterbury-Kaikoura ..	3,643,877	91.46	3,332,679
Otago-Southland ..	4,640,019	97.22	4,511,083
Dominion	20,742,646	93.11	19,313,525

Dominion Totals

The following table shows the estimated lambing for the North and South Islands for the previous five years together with the actual number of lambs tailed:—

Year.	Number of Breeding Ewes (*as at 1941). (†as at 1945).	Estimated Percentage of Lambs.	Estimated Number of Lambs.	Actual No. of Lambs Tailed.
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NORTH ISLAND.

1947 ..	11,695,633	92.47	10,814,554	—
1946 ..	†11,890,011	87.92	10,453,719	10,447,857
1945 ..	11,890,011	92.56	11,004,903	11,252,679
1944 ..	11,740,920	90.08	10,576,495	11,054,223
1943 ..	*11,268,384	87.18	9,823,748	10,654,244
1942 ..	*11,268,384	89.95	10,134,505	10,801,599

SOUTH ISLAND.

1947 ..	9,047,013	93.94	8,498,971	—
1946 ..	†8,975,847	91.69	8,229,713	8,194,441
1945 ..	8,975,847	92.75	8,324,990	8,308,779
1944 ..	8,808,796	94.07	8,286,568	8,399,083
1943 ..	*8,762,549	89.16	7,813,548	7,767,692
1942 ..	*8,762,549	93.34	8,179,674	8,063,293

DOMINION.

1947 ..	20,742,646	93.11	19,313,525	—
1946 ..	†20,865,858	89.54	18,683,432	18,642,298
1945 ..	20,865,858	92.64	19,329,893	19,561,458
1944 ..	20,549,716	91.79	18,863,063	19,453,306
1943 ..	*20,030,933	88.05	17,637,296	18,421,936
1942 ..	*20,030,933	91.43	18,314,179	18,864,892

"PELLETED" CLOVER SEEDS FOR SURFACE SOWING HILL COUNTRY

TRIALS with white and subterranean clover seed "pelleted" with clay, phosphate, and nitrogen in various proportions which will be laid down this autumn are expected to yield valuable information on the much-desired improved "take" of surface-sown clovers on hill country. There is increasing recognition by farmers of the great importance of white and subterranean clover on much of the hill-country grassland of New Zealand, but there are many areas where the broadcasting of the seed with or without fertiliser has given disappointing results. In the search for a method of ensuring that the seed will germinate and produce healthy plants, the method of pelleting, in which the seed will be sown already surrounded with the equivalent of the seed-bed it is obviously impossible to prepare in the normal way on hill country, has been suggested. This will simulate as closely as possible the practice of burying the seed in the ground, and may enable the rootlet on germination to penetrate the soil and survive more easily than is the case with broadcasting on hill country.

CERTIFICATION OF TESTED SEED PROTECTS BUYER

By A. V. LITHGOW, Liaison Officer, Seed-testing Station,
Palmerston North.

THROUGH the Seed-testing Station at Palmerston North the Department of Agriculture endeavours to assist farmers in their selection of good seed. When a sample of seed is tested a certificate of analysis is issued giving details of the purity and germination of the line.

The certificate in the accompanying illustration is for an analysis of Montgomery red clover seed and is evidence of the quality of the sample tested. The particulars on the top left-hand side identify the certificate with the line to which it refers. Details of the analysis occupy the remainder of the form, with a summary appearing at the top right-hand side.

The purity analysis shows that 98.2 per cent. of the line is pure red clover seed. There is a trace of other crop seed comprising white clover and perennial ryegrass. Weed seeds amount to 0.2 per cent. and comprise *Rumex acetosella*, *Plantago lanceolata*, *Cirsium lanceolatum*, and *Rumex crispus*. In addition there is present 1.6 per cent. of inert matter made up of broken and germinated seed and ergot. Crop seeds and weed seeds are given their botanical names, as any attempt at using common names would result in confusion because of the different names used in different districts. To assist in the interpretation of these certificates a list of both the botanical and common names of the more frequent impurities will be furnished by the Seed-testing Station at Palmerston North on request.

Beneath the purity analysis are given the particulars of the germination of the pure seed. These figures are expressed as a percentage of the pure seed in the line and not as a percentage of the total of the line. There are two spaces for germination counts. The first, or interim count, has been made after three days and indicates the speed of the germination. In this sample 70 per cent. of the pure seed has grown in three days. The final count gives the total percentage of the pure seed to germinate. In this case the figure is 85 per cent. The number of days at which these counts are made will vary with different kinds of seed. Hard seed, in the next column, refers to legumes only. It has been found that certain clover seeds, though quite sound, fail to germinate because moisture has been unable to penetrate the tough seed coat. Under field conditions due to rubbing or mechanical chipping a certain percentage of these will grow. Abnormal growths are those seedlings which have begun to grow but whose

characteristics show that they could never become normal productive plants. The remainder, 5 per cent., is seed which did not grow but did not come under the classification of hard seeds. The total of the figures—final count, hard seed, abnormal growths, and remainder—should always be 100 per cent.

Included in the summary in the top right-hand corner is the pure living seed, in this case 86 per cent. This figure means that in every 100lb. of seed 86lb. only are capable of growing and producing healthy Montgomery red clover plants. The discerning farmer will use this figure when comparing lines before purchasing. The summary also shows the percentage of pure seed and the percentage of germ-

ination, plus the percentage of hard seeds in the case of legumes. Beneath the summary are printed the letters "S.T.S. No." followed by the typed figures 47/54321. This is the number allotted by the Seed-testing Station and provides the laboratory identification of the sample. As soon as the sample enters the station it is given such a number, which is never duplicated. Whenever inquiries are made about the test of a line of seed the seed-testing number should be quoted.

At the bottom of the certificate appears the date of issue of the certificate and the signature of the officer in charge of the station. The date of issue of the certificate is important, as, if the test has been completed some considerable time earlier, it may be necessary to re-test the seed before an accurate estimate of its germination can be made.

The certificate is issued to protect the buyer of the seed, and intending purchasers should study its details carefully if they wish to be sure of getting good seed.

NEW ZEALAND DEPARTMENT OF AGRICULTURE				
Ag. F. 25.		FIELDS DIVISION		69548
SEED-TESTING STATION		CERTIFICATE OF ANALYSIS		
SEED: Montgomery Red Clover	PURE SEED: 98.2 %			
BRAND: C D	GERMINATION: 85.7 %			
SACKS: Six	PURE LIVING SEED: 86 %			
	S.T.S. No. 47/54321			
PURITY ANALYSIS				
PURE SEED	OTHER CROP SEED	WEED SEED	INERT MATTER	
98.2 %	trace%	0.2 %	1.6 %	
CROP SEED:		WEED SEED		
Trifolium repens Lolium perenne		Rumex acetosella Plantago lanceolata Cirsium lanceolatum Rumex crispus		
INERT MATTER: Broken and germinated seed, ergot.				
GERMINATION TEST OF PURE SEED				
INTERIM COUNT	FINAL COUNT	HARD SEED	ABNORMAL GROWTHS	REMAINDER
70 % IN 3 DAYS	85 % IN 8 DAYS	7 %	3 %	5 %
PALMERSTON NORTH. 2nd October, 1947.				
Messrs. ----- MASTERTON.				
ENDORSEMENT THIS ANALYSIS REFERS ONLY TO THE SAMPLE SUBMITTED UNDER THE DESCRIPTION AS ABOVE.				
OFFICER IN CHARGE.				

HOW TO MAKE AND USE AN OBSERVATION BEEHIVE

By D. S. ROBINSON, *Apiary Instructor, Hastings.*

SOME of the most interesting studies of bees and colony life may be made with an observation hive, which may be made easily by anyone handy with wood-working tools who follows the illustrations and instructions in this article. Much pleasure and knowledge of the habits of bees may be derived from watching them at work within the hive.

VARIOUS types and sizes of observation hives are in use. The details given here are for building a hive to take one full-depth and one half-depth standard-size frame. The wood chosen for making the hive must be dressed both sides and edges, and must be thoroughly dry and free from defects. The glass for the sides should be 16oz. glass carefully selected and free from flaws.

Materials and Construction

The materials required are as follows:—

- 1 piece of timber 24in. x 6in. x 1in.
for base;
1 piece of timber 24in. x 5in. x 1in.
for top;
2 pieces of timber 15½in. x 3½in. x
1in. for ends, grooved for glass:

- 2 pieces of timber 8in. x 2in. x 1in.
for legs;
4 pieces of timber 2in. x $\frac{1}{2}$ in. x $\frac{1}{2}$ in.
for ledges to support frames;
2 round knobs $1\frac{1}{2}$ in. in diameter for
ornament on top of hive.

- 4 pieces wire gauze cloth each 2in.
x 2in. to cover ventilation holes.

- 2 pieces of 16oz. glass approximately
20in. x 15in. or cut to correct size.

The hive consists of a base 6in. x 1in. x 24in. on which are fixed by screws from the underside two upright end pieces each 3in. x 1in. x 15in. (see diagram). These ends are fixed 19in. apart (inside measurement) at equal distances from each end of the base.

The two end pieces are grooved on the inner sides to take the glass sides.



The observation hive assembled, with frames holding combs, brood, and bees in position.

These grooves $\frac{3}{16}$ in. wide and $\frac{1}{4}$ in. deep are cut $\frac{1}{4}$ in. from the outer edge, which allows a distance of $\frac{1}{2}$ in. between the glass sides (see diagram). On each end piece are fixed two pairs of ledges each 2in. x $\frac{1}{4}$ in. x $\frac{1}{4}$ in. on which to hang the frames containing bee combs and bees.

The first pair of ledges are fixed at a distance of 9½ in. from the base to the top of the ledge and the second pair 5 in. from the top of the first ledge to the top of the second ledge. The top piece consists of a board 5 in. x 1 in. x 24 in. carefully checked out ½ in. deep by the finished size of the end pieces to allow the top to fit over the ends as illustrated. The top may be held in position by screws through the top piece into the ends below or by small hooks and staples.

When the hive is put together accurate measurements may be taken for the size of the glass sides. The glass should not fit too tightly in the grooves, but a fairly close fit is desirable where the glass sits on the base, and also where the top piece rests on the glass.

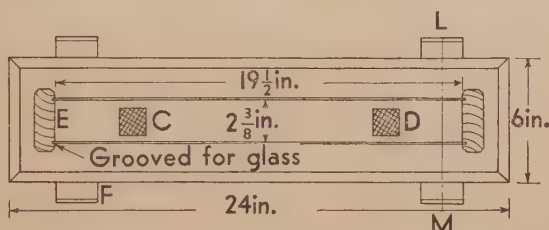
A leg 2in. x 1in. x 8in. is fixed under the base at 2in. from each end. The outer edges of all woodwork may be bevelled to give the hive a neat appearance.

Two 1 in. holes in the base and top piece about 6 in. from each end covered with wire gauze cloth and tacked into position provide the necessary ventilation for the hive.

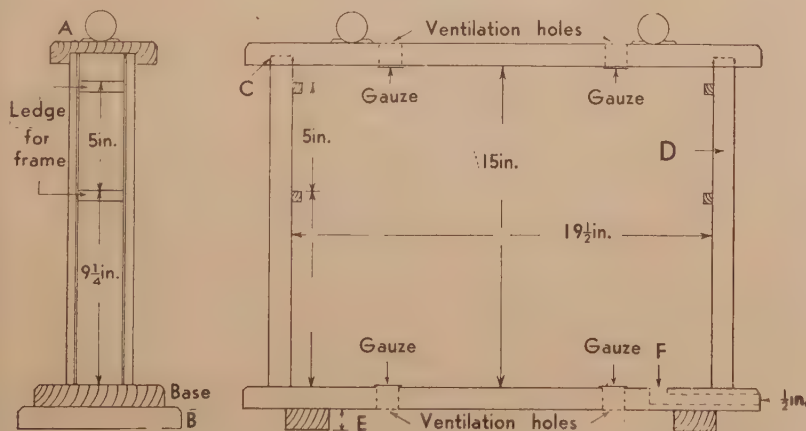
Painting

The finished hive may be rubbed down with fine glass paper and then given a light coat of priming paint; this should be allowed to dry, then rubbed down again with very fine glass paper, after which a coat of flat paint should be applied. When this is thoroughly dry a coat of light-coloured enamel will give the hive a pleasing appearance. A few days should be

DIAGRAMMATIC DETAILS OF CONSTRUCTION



PLAN. C and D—Ventilation holes covered with gauze. E—End, $3\frac{1}{2}$ in. x 1 in. x $15\frac{1}{2}$ in. F—Leg, 8 in. x 2 in. x 1 in.



Left—Section through L-M on plan. A—Top, 5in. x 1in. x 24in. B—Leg, 2in. x 1in. x 8in. Right—Side elevation. C—Top checked out $\frac{1}{2}$ in. to take ends. D—Ends, $3\frac{1}{2}$ in. x 1in. x $15\frac{1}{2}$ in. E—Leg, 1in. F— $\frac{1}{2}$ in. exit if required.

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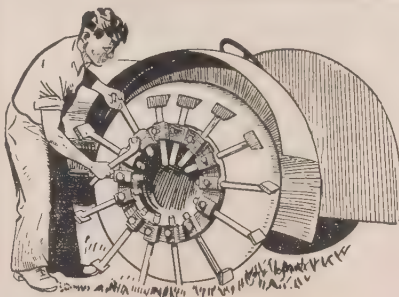
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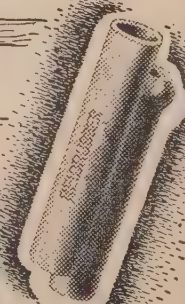
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allowed for the paint to dry and the fumes of the paint to dissipate before the bees are placed in the hive.

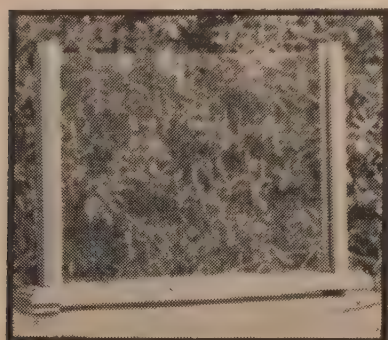
If it is desired to keep the bees in the hive for more than three or four days they must have an exit, which can be provided by boring a hole $\frac{1}{2}$ in. in diameter $\frac{1}{4}$ in. deep in one end of the base. This hole is met with a hole $\frac{1}{2}$ in. in diameter bored $\frac{3}{4}$ in. deep through the floor of the hive $\frac{1}{4}$ in. from the same end and in line with the $\frac{1}{2}$ in. hole. A wooden tunnel is attached to the hive leading to an alighting board $3\frac{1}{2}$ in. x $3\frac{1}{2}$ in. The inside measurement of the tunnel should be $\frac{1}{2}$ in. x $2\frac{1}{2}$ in. and long enough to pass through a hole in the wall or under the bottom sash of a window. If a window is used, the open space must be blocked so that bees can leave and get back to the hive only through the tunnel provided.

Placing Bees in Hive

In preparation for placing the bees in the hive remove the top piece and one glass side and select a good, clean, full-depth frame with honey, pollen, eggs, and brood in all stages, including queen and adhering bees. The top of the frame should be scraped clean of any burr comb. Hang this frame on the two lower ledges. Then select a half-depth frame containing honey, the bottom bar of which should be scraped clean. Hang this frame on the two upper ledges, and replace the glass side. Next shake in about half a pint of young worker bees. Replace the top of the hive and fasten down.

A piece of wet sponge placed in one of the ventilator holes in the top of the hive will enable the bees to collect sufficient moisture for their requirements.

Should it become necessary to feed the bees, the top frame may be removed and replaced with a frame containing honey, or a shallow tin containing either honey or sugar syrup (composed of 2 parts sugar dissolved in 1 part of warm water) may be placed under the bottom frame. This can be done by first lifting the top piece of the hive and raising one of the glass sides sufficiently to slide the tin of feed under the bottom comb, replacing the glass side and the top



The hive with top and one glass side removed.

piece of the hive when the tin is in position. If the sugar syrup is coloured with a little harmless food colouring matter such as cochineal, it is possible to watch where the bees store the syrup in the empty cells and how they may move it from time to time.



Placing frames and bees in position in the hive.

The hive should be kept in a moderately warm place free from draughts, and when not being viewed it must be kept covered to exclude the light and conserve the warmth of the hive. Two pieces of cardboard may be cut to fit over the glass sides and a thick cloth used to cover the hive. These are readily removed to observe the habits of the bees.

Observation of Life Cycle

Placing of the queen bee in the hive with the bees enables the life cycle of the bee to be watched. Any particular cell in which the queen is seen to deposit an egg may be noted and the position of the cell marked with a piece of adhesive paper on the glass side. The egg may be seen in different positions in the cell from day to day; after it is hatched into the larval stage at the end of three days it is fed by the nurse bees with a mixture of bee bread (pollen), honey, and water. The larvae of worker bees are fed for five days and those of the drone for six to seven days, after which the cells are capped by the bees. As soon as the cells are capped the grub in each cell begins to spin a web or cocoon around itself. This spinning goes on for 36 hours and is followed by a period of apparent rest and subsequent metamorphosis. During this time a transformation, which includes the pupa or nymph period, is taking place from hour to hour, and lasts for 12 days in the case of the worker bee and $14\frac{1}{2}$ for the drone. On the 21st day from the laying of the worker egg or the 24th from the laying of the drone egg the fully-formed bee cuts through the capping of the cell with its mandibles and emerges complete in every

... AN OBSERVATION BEEHIVE

respect and ready for its various duties, which it undertakes without any previous training, education, or experience.

The manner of nurse bees feeding the larvae may be noted, and if the bees have access to the fields through an open entrance, pollen gatherers may be seen coming back to the hive with their pollen baskets laden with pollen of various colours, according to the individual flower each bee is working.

It is interesting to watch the attention the worker bees pay to the queen bee, feeding her and at times grooming her with their antennae.

If a frame of Italian brood is placed into a hive of black bees, or vice versa, the newly-emerged bees and their progress can be followed better.

These are but a few of the interesting sights that may be seen by keeping an observation hive stocked with bees, in some convenient place such as a schoolroom, shed, or living room where the bees will not be subject to jarring of the floor, overheating, or cold draughts.

Appreciation is expressed to Mr. P. Berry, Arataki Apiaries, Havelock North, for the use of his bees and his assistance in taking the photographs for this article.

Flock House Trainees Visit Stud Farm

AS part of the new training policy of the Flock House Farm of Instruction trainees recently attended a field day at the Polled Angus stud farm of Mr. G. L. Marshall at Turakina.

Mr. Marshall gave an interesting and instructive lecture on Polled Angus cattle and demonstrated two-year-old bulls, yearling bulls, and heifers. Mr. J. Caithness, a fat-stock buyer of Marton, spoke on the stock requirements of the beef trade. Both lecturers answered numerous questions from the trainees.

After the lectures the cattle were divided into age and sex groups and the trainees judged the best, second, and third best animals in each group. Mr. Marshall analysed the placings and explained why the animals should be in a certain order of merit.

Mr. Marshall's Polled Angus herd was established in 1937, when he purchased an unbeaten American bull named by him "Ambition of Greenbank" and an in-calf heifer to the same bull named "Barmar Quality Lass II." It was apparent to the trainees that Mr. Marshall's management and handling of the stock had undoubtedly played a large part in the success of his stud farm.

J. H. HITCHCOCK,
Farm Training Supervisor,
Flock House Farm of Instruction.



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WHEAT

Bulletin 287, "Wheat," describes the place of wheat in the rotation, the growing and harvesting of the crop, as well as the fungous diseases and insect pests of wheat.

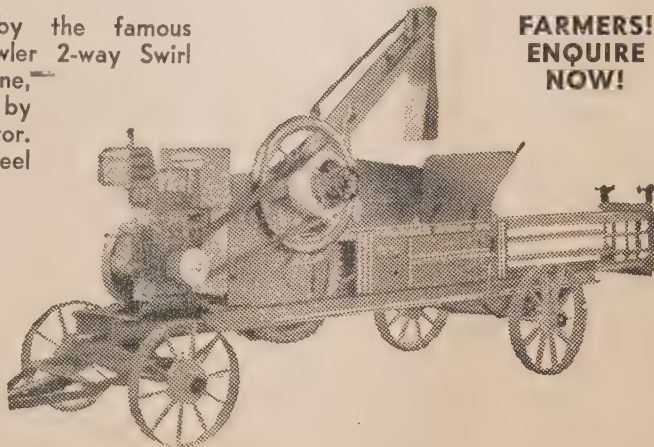
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CASE

Wastage of Whey that could be Used as Pig Food

By A. LONGWILL,

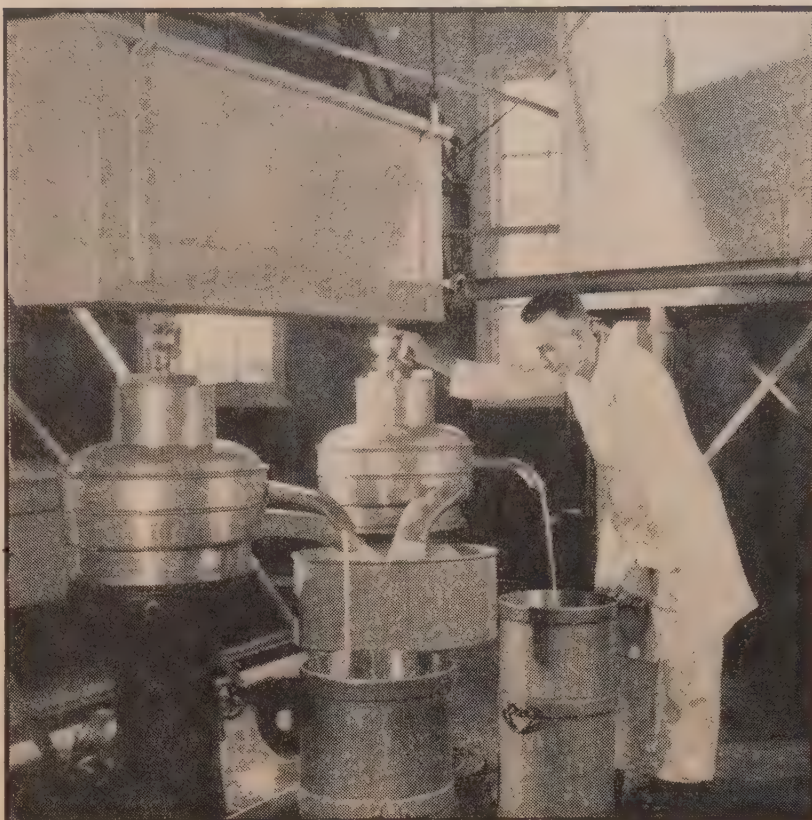
Assistant Superintendent of the Pig Industry, Wellington.

NEW ZEALAND pig production has fallen 30 per cent. from the peak figure of 1941-42. Much of that reduction can be accounted for by the decrease in the number of cows milked, changes in dairy manufactures, the drying of milk and buttermilk, the smaller quantity of concentrate foods available for pig feeding, the increase in local milk consumption, and the shortage of labour on farms. However, a closer look at the efficiency with which the by-products of the Dominion's great dairy industry are used yields results which are interesting and informative. It is fairly safe to assert that the use made of whey—the most difficult of the dairy by-products to handle—is less satisfactory than that made of skim-milk and buttermilk.

DURING the 1946-47 dairying season a postal survey was carried out, covering all dairy factories making cheese and casein, to obtain a clear picture of the amount of whey being used and the amounts going to waste month by month throughout the season. Returns were received from more than 90 per cent. of the factories concerned. As the survey was concerned mainly with the possibility of putting whey to better use as a pig food, the returns were grouped on the basis of district pig council areas and summarised. Pig councils were then asked to comment on the position in their own areas, and their comments are included in this report.

The survey showed general agreement on the fact that wastage of whey has increased considerably since 1939, but the extent of the increase cannot be gauged accurately because of lack of precise data of the position at that time. Further, though suppliers are compelled by their dairy companies to take their whey, in certain cases it is known that a considerable proportion is not used for pig feeding but is distributed on pastures or even tipped into drains.

The whole picture is not very pleasing, and it is evident that the economic set-up in the dairy industry, which is basically responsible for the flagging of interest in the use of by-products on the farm, urgently requires review if a valuable pig industry with an assured market is not to be sacrificed.



[National Publicity Studios photo.]
Whey drained from the curd during cheesemaking contains a small percentage of butterfat, which is extracted from the whey in the type of large separators illustrated.

Summary of Wastage

The table on the next page shows the position as revealed by the survey. The estimate of potential pig meat production from the whey going to waste is based on the assumption that for its proper utilisation the whey would have to be supplemented by home-grown crops, grass, and meals to an amount equal to two-thirds of the food value of the whey.

This account of a survey of whey utilisation and waste will be of interest to everyone concerned with the full utilisation of dairy by-products, and in particular to those who are concerned to arrest further decline in pig production. Britain urgently needs every pound of pig meat New Zealand can export, and a wastage of feeding material which could be used to increase production may be looked at askance. The second half of this article, to appear next month, will give practical examples of the successful use of whey for pig feeding.

Northland District

The one factory in the Northland area, at Waimamaku, is in an isolated position and, in spite of efforts by the company, only two suppliers of a total of 17 are making use of the whey. Labour shortage is stated to be the chief reason why suppliers are not keeping pigs.

Auckland District

The position in the Auckland area is greatly complicated by the fact that four of the factories concerned act as balancing stations for city milk supply. Drury and East Tamaki are purely balancing stations and make cheese for only a few months in the flush of the season. The whole of the whey produced at these two plants goes to waste. With the present dependence of the pig industry on cheap dairy by-products as the basic feed for most of the year, it is obvious that the task of organising the use of large quantities of whey each year from September to January inclusive and finding the necessary foods for the rest of the year elsewhere is far from simple. Pig

WASTAGE OF WHEY FROM FACTORIES . . .

feeders in the vicinity of the city who have a continuous supply of feed in the form of garbage or by-products may be able to organise their businesses to take surplus whey during the months mentioned, but the overhead costs involved in carrying a considerably-increased number of pigs for a few months would limit such possibilities severely.

Evaporating and sugar of milk extraction plants might be considered, but they do not appear to offer a solution for the following reasons:—

1. Of the 7,255,000 gallons of whey going to waste in this district about half is produced in Franklin and Manukau Counties and half in the Hauraki Plains area. Neither would in itself maintain an economic producing plant.

2. The short season and large fluctuations in the Franklin and Manukau area would constitute a further economic hazard.

3. The radius of collection to a central plant is probably beyond economic limits with present high haulage costs.

Reasons given in this area for failure to use the whey for pig feeding, apart from the obvious difficulties mentioned, are:—

1. Supplemental feeds, particularly meat meal, are in short supply.

2. On the Hauraki Plains drainage and soil conditions often make pig keeping difficult.

3. The cost of haulage of whey is too high.

4. Farm labour is insufficient.

Waikato District

In the Waikato district the position is not complicated by the presence of large town-supply balancing stations and the wastage is much less. However, it is considerable and will probably increase with the change to casein manufacture which is still taking place.

The higher pay-out for casein manufacture and the collection of milk by the factory are very attractive to farmers, who are thus relieved of the work of delivering their milk to the factory and taking away their share of whey. There is less than no incentive for the supplier to make use of his

whey and, naturally, the tendency is for increased wastage.

The position appears anomalous for the pig industry in that the casein supplier, who has dispensed with all pig production costs, secures a return greater than the gross return received for both butterfat and pigs by his neighbour who supplies a cheese factory. That gives rise to dissatisfaction among cheese factory suppliers and increases the tendency, always noticeable when butterfat prices are high, to reduce pig production.

The value of casein whey is practically the same as that of cheese whey and it is therefore unfortunate that huge quantities are being wasted. It is centrally bulked at the factory and, though storage may not be available at present for the increased volume handled, a central factory piggery could handle much of the whey that is at present being wasted. However, with the indefinite future of the market for casein, there is not sufficient security to encourage anyone to spend the money on the large piggery that

If suppliers cannot make use of that whey, there would be scope for a small commercial piggery near the factory if it were permitted to draw a uniform proportion of the total supply throughout the year.

Tairawhiti District

Two factories in the Tairawhiti area make cheese. At Nuhaka up to 30 per cent. of the whey may be wasted for a short time during the flush of the season and an effort is being made to encourage suppliers to plan their pig-breeding programme so as to use this supply to better advantage.

At Waiohiki, which is a balancing station for Napier milk supply, more than 80 per cent. of the total whey produced is wasted at present. This supply has the complications common to balancing stations in that the surplus stops in January. However, an effort is being made to interest local farmers in the possibility of using this whey in conjunction with other feeds grown on the farm.

Taranaki District

Half the Dominion's cheese is made

in Taranaki, so the position there is of particular interest. The percentage of waste compares favourably with that in other parts of the country. In such an intensive dairying district, where suppliers deliver their milk to the factory and in many cases are compelled to take away their share of whey, that is natural. However, some of that taken away is simply tipped or sprayed on to pastures as a top-dressing, as the suppliers concerned have not

Pig council area	Tons of cheese (C) and casein (Ca)	Total whey (thousands of gallons)	Wastage (thousands of gallons)	Percentage of waste	Estimate of potential pig meat production (thousands of lb.)	Remarks
Northland	200 C	333	310	93	44	One factory
Auckland	8,639 C	15,705	7,255	46	1,037	Balancing stations for city milk supply
Waikato	7,031 C 1,594 Ca	22,623	2,850	13	407	Waste increasing with change to casein
Bay of Plenty	1,336 C	2,227	436	20	62	Three factories
Tairawhiti	284 C	471	173	37	24	Mainly from town-supply balancing station
Taranaki	45,833 C 750 Ca	80,609	9,630	12	1,370	
Wellington	13,910 C	23,192	3,478	15	497	Several estimates involved because of lack of returns
Canterbury	3,245 C	5,350	500	9	70	Mainly from two factories
Otago and Southland	10,511 C	17,625	4,990	28	710	About 8,000,000 gallons used for sugar of milk extraction
Dominion	90,989 C 2,344 Ca	168,135	29,622	17.6	4,221	Equivalent to 1,900 tons of pig meat

would be required. The only possible solution seems to be to encourage the use of the whey on suppliers' farms as in the past, but financial inducement, which does not exist at present, will first have to be provided.

Bay of Plenty District

Only three factories in the Bay of Plenty area make cheese, the two factories of the Opourao Dairy Company and Waimana. In the first two wastage is stated to be considerably less than the general average, but at Waimana about half the whey produced is wasted. With the necessary supplementary feed the whey wasted would be sufficient to produce an extra 300 to 400 pigs a year.

the labour or the inclination to produce pig meat.

The erection of a sugar of milk extraction plant at Kapuni to handle 10,000,000 gallons of whey a year will help considerably to reduce the wastage of whey in this area. Though more than half the food value in the whey is extracted in processing, the whole of the by-product, mother liquor or whey paste, will be available as a stock food, and though it may not all be used in the Taranaki district, the wastage of whey in the province should be considerably reduced.

Wellington District

Though the Wellington District Pig Council has not offered any comment

WHEY FROM CHEESE FACTORIES

and some factories failed to send returns, it appears from the returns of those co-operating that the percentage of waste is about the general average. The figures for individual factories show wastage varying from practically nothing (a certain amount of waste occasionally in the flush is usually unavoidable) up to as high as 70 per cent. Though special factors may affect those showing high wastage, it would appear that with an organised effort better use could be made of the whey.

Canterbury District

In the Canterbury-Marborough-Nelson area utilisation of whey is generally good. Only two factories show any considerable waste and these, Barry's Bay and Pigeon Bay, are so situated that the more outlying suppliers find cartage costs on return of whey to the farm too high. Barry's Bay suppliers who farm on the flat

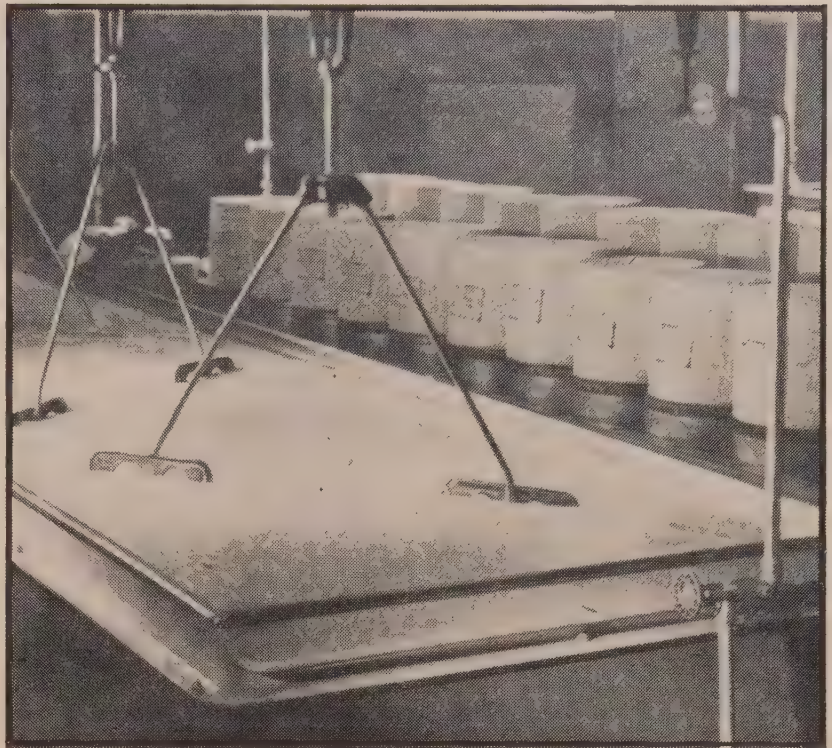
MEAT PRODUCTION
565,000 TONS
Is the Aid for Britain Target

near the factory take three-quarters of the total whey. Practically none of the whey produced at Pigeon Bay is used and, if suitable ground is available, there is scope for a piggery convenient to the factory to deal with all the surplus. It could best be run by the dairy company itself and should prove worth while.

Otago and Southland

Southland is an important cheese-producing district and in intensive dairy districts a fairly-high degree of utilisation of whey might be expected, but the wastage there is considerable. About 8,000,000 gallons are taken for processing for sugar of milk and more than half the remainder goes to waste. Most of the mother liquor from the Edendale plant is used locally, but there appears to be further room for the use of this storable commodity to help in wintering breeding stock and stores in sufficient numbers to ensure having pigs available to use the balance of the fresh whey which is at present going to waste.

This survey has revealed that wastage of whey from cheese and casein factories throughout the country varies from negligible amounts up to virtually 100 per cent. With a bulky food such as whey, the large fluctuations in supply, and the difficulty of balancing it correctly as a food for pigs, it is reasonable to expect that there will be some wastage. Peculiar difficulties in some districts increase wastage to a high percentage of output. These difficulties must be studied locally and, if possible, a solution found to prevent the present wastage of potential human food.



Above—Stainless steel agitators operating in a 900-gallon vat of milk in a cheese factory. Below—Whey being drained from the small cubes of curd.



A PORTABLE TRACTOR SAWBENCH

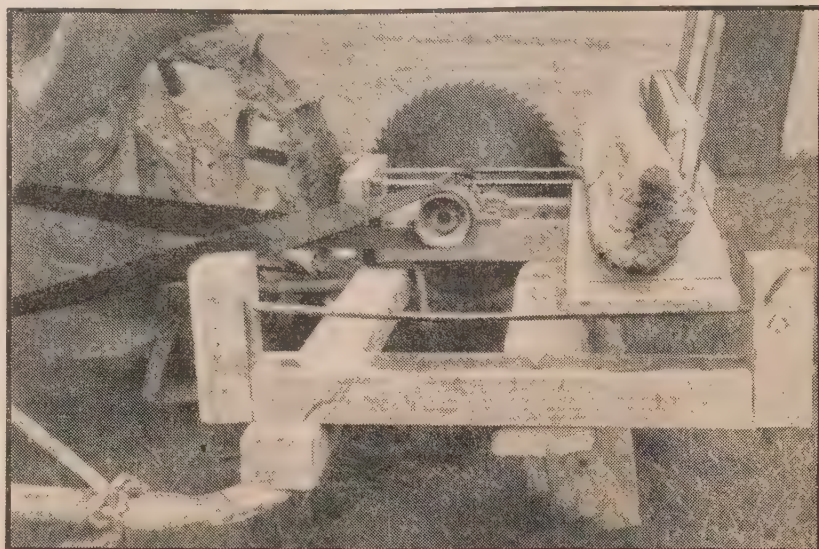
By P. S. SYME, *Instructor in Agriculture, Warkworth.*

MOST farmers are heavy users of firewood and therefore will be interested in a home-made tractor sawbench designed by Mr. J. F. W. Ferguson, a Warkworth (Auckland) farmer. It has shown both its operating efficiency and its ability to travel, having provided a solution to the firewood problem for Mr. Ferguson and some fortunate neighbours for some months.

THE framework is constructed mainly of 4in. x 3in. timbers bolted together. The feeding platform consists of a piece of 9in. x 1in. board fitted with guide rings underneath to slide backward and forward along three lengths of $\frac{1}{2}$ in. pipe carried on short uprights attached to the frame. A vertical backrest holds the log in position to be sawn.

The bench is bolted directly to the drawbar by two bolts and it can be attached or detached in a few minutes. When the saw is in operation a stout block of wood is placed under the outer cross-member of the frame to carry part of the weight and ensure stability.

The saw used is 20in. in diameter and is driven by a $4\frac{1}{2}$ in. pulley connected by a crossed drive belt to a 15in. pulley on the tractor. Mr. Ferguson estimates the idling speed of the tractor at about 450 revolutions a



The sawbench attached to the tractor and ready for operation, with a supporting block under the outside cross-member.

minute, which gives a satisfactory saw speed of about 1500 revolutions a minute.

No Danger to Operator.

When sawing firewood the operator merely feeds the log along the platform and pushes the platform toward the saw. The design permits the operator to stand well clear of the line of the saw and obviates any danger to his hands.

Farmers will understand the convenience afforded by this simple port-

able sawbench. It is quickly and simply attached to the tractor and the pulleys are automatically in alignment. Only the removal of the block is necessary for the tractor to be able to be driven to a stand of firewood, the belt acting as a tie rod to ease the strain on the drawbar. On arrival at the site the supporting block is placed in position and the outfit is ready for work. Despite the somewhat unorthodox method of attachment the machine rides well.

SHOW DATES

THE following are dates and venues set down for A. and P. shows in February and part of March. Owing to health precautions these are subject to cancellation.

- February 3 and 4—Feilding I. A. and P. at Feilding.
- February 5 and 6—Feilding Ram Fair at Feilding.
- February 6 and 7—Taranaki Metropolitan A. and P. at New Plymouth.
- February 7—Woodville A. and P. at Woodville.
- February 7—Hukerenui A. and P. at Hukerenui.
- February 7—Waihi A. and P. at Waihi.
- February 7—Clevedon A. and P. at Clevedon.
- February 10 and 11—Dannevirke District A. and P. at Dannevirke.
- February 12—Dannevirke Ram Fair at Dannevirke.
- February 13 and 14—Rangitikei A. and P. at Taihape.
- February 14—North Kaipara Agricultural Association at Paparoa.

- February 14—Pahiatua A. and P. at Pahiatua.
- February 14—Murchison A. and P. at Murchison.
- February 14—Te Awamutu A. P. and H. at Te Awamutu.
- February 18—Opotiki A. and P. at Opotiki.
- February 20 and 21—Buller A. and P. at Westport.
- February 20 and 21—Ohura A. P. H. and I. at Nihoniho.
- February 20 and 21—Masterton A. and P. at Masterton.
- February 20 and 21—Franklin A. and P. at Pukekohe.
- February 21—Whakatane and Rangitai A. and P. at Whakatane.
- February 21—Banks Peninsula A. and P. at Little River.
- February 23 and 24—Masterton Ram Fair at Masterton.
- February 27 and 28—Auckland Metropolitan A. and P. at Auckland.
- February 28—Waimarino A. P. H. and I. at Raetihi.
- February 28—Te Puke A. and P. at Te Puke.
- February 28—Waiapu P. and I. at Ruatoria.
- March 1—Matamata A. and P. at Matamata.
- March 6—Albany A. and P. at Albany.
- March 6—Mangonui County A. and P. at Kaitia.
- March 6—Maniototo A. and P. at Ranfurly.
- March 6—Waioitira A. and P. at Waioitira.
- March 10—Morrinsville A. and P. at Morrinsville.
- March 12 and 13—Whangarei A. and P. at Whangarei.

"TOMATOES INJURED BY HORMONE WEEDKILLERS"

IN the article "Tomatoes Injured by Hormone Weedkillers," published in the October issue of the "Journal," it was stated in the section "Accidental Injury in Field" on page 351 that "Under glass it has been found that vapour from plants sprayed with a trace of 2.4D will cause distortion in tomato plants ft. away." This should have read "... 8ft. away."

"He Who Helps a Crippled Child . . ."

THE cornerstone of Rotary International is "Service before Self." Of the many estimable achievements resulting from the endeavours of the New Zealand Rotary movement to live up to this ideal none is more worthy than the work it has done for the cripples of this country. To Dr. Alexander Gillies, of Wellington, goes the honour of having enlisted the sympathy of his fellow Rotarians in the needs of the crippled child, the outcome being the formation of the New Zealand Crippled Children Society. The initial expenses in the formation of the society, together with those of the branches set up in various towns, were met by the Rotary clubs. Rotarians also gave generously to the general funds, which were augmented by two liberal donations from Viscount Nuffield, and the income from the Nuffield Trust Fund provides the basic means of financing the ever-increasing activities of the society.

Ten years ago, when the society was in its infancy, there were 1409 cripples on the register; today the number of crippled boys and girls totals 4525. Many of them have been located by the travelling orthopaedic clinics which function in close co-operation with the Department of Health and the hospital boards, and it is believed that there are still another 2000 cases to be discovered and treated. These clinics usually travel at three-monthly intervals, when a specialist goes "on tour" through a rural district, setting up his surgery in a cottage hospital or Plunket rooms so that cripples in the vicinity may have the benefit of expert diagnosis and advice. He then moves on to the next little township. Handling from 30 to 40 cases a day on an average, he sometimes spends as long as 14 days in a district if it is a large one. Some of the children living in the more remote areas have had to travel all the previous day, crossing swollen rivers and jolting over rough tracks on horseback or in a cart—and only a cripple fully knows just how painful such a journey can be—in order to attend the clinic. One girl who had serious thigh injuries caused through an accident was brought all the way from Rarotonga (for the society's services extend to all dependencies of New Zealand). She has since returned home, the latest report on her case stating that she is very well, walks with ease, and dances successfully.

In one district alone 36 patients (the youngest a 12-month-old baby and the eldest a lad of 17) who were examined at the clinic had disabilities ranging from club feet, curvature of the spine, arthritis, and contracture of the fingers, to infantile paralysis, T.B. of the knee, Little's disease, and severe spasticity. Imagine what it means to such children (and to their parents), to have access to the most effective methods of treatment and the prospect of becoming useful and esteemed members of the community. The heartening fact concerning the crippling diseases of early childhood is that a large number can be cured if treated soon enough. Whether the remedial work can be carried out at home or whether the patient has to undergo hospital treatment, the society does all in its power to solve the problems, both large and small, which beset the cripple, thus supplementing the assistance of the State.

Vocational training and expert guidance in securing suitable employment are readily available, and many an afflicted child has been helped to a more hopeful outlook on life by being given tuition in painting, handicrafts, or some other creative hobby. Welfare officers visit cases regularly. They are always ready to advise and aid parents regarding the patient's welfare.

The society also supplies crutches, wheel chairs, warm clothing, special footwear, etc., when needed, and a most interesting experiment was carried out recently when a 5-year-old child from a farming district near Wellington was fitted with an artificial forearm before she started school. Though this little lass was born with her left forearm missing, she had learned to do many small tasks about the house, using the stump of her arm for such difficult jobs as threading a darning needle and sewing on buttons. Her delight at having two hands (albeit



[*"Free Lance" photo.*]

one was of padding disguised by a neat nappa glove) caused observers to render Masfield's lines thus:—

*... He who helps a crippled child
Makes joybells ring in Heaven's street.*

The women's service auxiliaries attached to the society's branches nobly live up to their name, the work of the Wellington auxiliary typifying the efforts of these groups of volunteers to give happiness to handicapped children. They not only take games, books, and fruit when visiting them, but arrange treats whenever possible, a memorable occasion being a trip to the Wellington zoo, where nine carloads of cripples were given lunch, and the shopkeeper declined to take any payment whatsoever for the ice cream, drinks, and sweets which had been ordered, and the keepers brought out some of their charges for the visitors' closer inspection, and a tiny monkey dressed up in checked rompers performed before an appreciative audience. On the return journey one backblocks child who had spent most of her life lying flat in irons remarked that she had never been in a shop before, so the auxiliary promptly made plans for another outing, a drive through the city, with a traffic officer on a motor cycle preceding the procession, through the Hataitai tunnel, and out to Evans Bay, where they saw a big ship being hauled up the Patent Slip. The day's highlights included hearing the band, watching the scouts embark for the jamboree, and being entertained to afternoon tea in a lovely garden at Lower Hutt where each guest received a posy and a gift of sweets.

The jubilee celebrations of the Correspondence School were attended by crippled pupils not only from the Wellington district, but from North Auckland, Taranaki, and Canterbury, and the society was responsible for their transport to all the functions. When Viscount Montgomery made his triumphal tour of the capital members of the society conveyed children from the orthopaedic wards at Silverstream Hospital by car to the Cenotaph, where they were given a special place in front of the crowds so that they could share in the welcome to the famous Field-Marshal.

Another important branch of the society's work is giving assistance to parents whose child has the misfortune to be born with a hare lip or cleft palate. This enables mother and baby to travel from even the most distant parts of the Dominion to the Bassam, the plastic surgery clinic at Lower Hutt, where

CRIPPLED CHILDREN . . .

Dr. H. P. Pickerill, and his wife, Dr. Cecily Pickerill, carry out the operative treatment which will free the child from all traces of his former disability. Usually it is advisable for the cleft palate treatment to commence when the baby is $2\frac{1}{2}$ to 3 months old while the bones are still soft and can be moulded into normal shape if necessary. Moreover, no shock is experienced by the child, neither does he retain any memory of his deformity in after years. (This also applies to the early treatment of webbed fingers, drooping eyelids, and other birth defects.) The fundamental principle at the Bassam in keeping mother and baby together so that the little one can have the constant care and loving attention which only a mother can give (for no operation can succeed if a baby is fretful and losing weight) is paying valuable dividends in human well-being; so far the clinic has not had a single case of cross-infection or failure of cleft palate.

Set back a short distance from the street, and sheltered by trees, the Bassam has the appearance of an attractive modern bungalow built facing the sun. The mothers' and babies' rooms look out on to flower beds where hydrangeas and azaleas are growing and lachenalias brandish sharp leaf spears above the brown earth, and the driveway beyond is bordered with primroses. Floral patterns predominate indoors, curtains and bedspreads being of printed linens in pastel tonings or warm beechnut browns and moss greens. Each room has its easy chair and neat tallboy, a conveniently-designed fitment to hold an infant's personal requirements, and a radiator with a guard which Dr. Pickerill himself has attached.

The first baby we saw was a bonny 3-month-old boy from Hamilton. He had been in residence only two days, but his operation had upset his routine so little that he had not cried once at night, settling down in his Plunket cot beneath its white woollen coverlet appliqued with pink and blue rabbits as if he were in his own bed at home. The child in the adjacent room, though much older, was also deep in slumber, her fair hair fanned out upon the pillow, and a strip of sticking-plaster extending across her sleep-flushed cheek to hold the dressing in place above her mouth. The baby next door should have been asleep, too, but he lay gazing at the beflowered draperies covering the hood of his bassinet and made tiny whimpering noises to himself. He soon quietened at the sound of the doctor's voice and settled down for his morning nap; it was good to know that his series of treatments for cleft palate were now finished and his disfigured upper lip would soon be as free from blemish as the rest of his round, rosy face. His neighbour was a wide-awake, wee girl with a most fetching topknot and wondering brown eyes that followed our every movement. The occupant of the corner room had brown eyes, also, and soft dark curls above her turban of bandages. She wore stiff cuffs of pretty sprigged material fitting from wrist to elbow, these preventing her from touching the bandages over her ears, yet allowing her enough freedom of movement to play with her



["Free Lance" photo.]

toys. I offered her a rattle which had fallen to the floor, but she much preferred to finger my wrist watch. She made a charming picture holding court in her cot and we parted company with mutual regret.

Every day is wash day at the Bassam, but rinsing out small garments is no drudgery in the pleasant laundry, where the shelves for holding soap powders and the like are covered in gay, checked American cloth, and a novel array of baby baths decorates the green walls. The mothers vie with each other in keeping their rooms spotless, taking turns in helping with the communal chores. These completed, a friendly group gathers out of doors to knit and chat, meanwhile keeping an eye on the prams ranged in a sheltered corner. When it is too windy to sit outside in comfort they can enjoy whatever sun there is on the long, glassed-in veranda or congregate in the dining-room with its deep window recess, brick fireplace, and cosy red and blue carpet.

The theatre block has a garden setting, a singularly-appropriate arrangement in view of the fact that Dr. Pickerill, who is one of the pioneers of plastic surgery and has been awarded the C.B.E. for his services, founded his remarkable technique upon his study of grafting flowering shrubs and fruit trees. Once he became proficient in horticultural grafting he applied the same methods to human beings, most of them soldiers with terrible facial injuries sustained in the First World War. The closer he kept to the details he had learned in the horticultural nurseries the more successful were the results. One secret still remains to be discovered, however, and that is how to graft skin from one person to another. This knowledge would be of tremendous help to plastic surgeons, especially in bad burn cases where there is not enough skin left to use for grafting. The problem should not prove insuperable, as corneal grafting has been practised successfully for a considerable time. Perhaps some keen young medical student in this country will make it the object of his research and light upon the answer, thus enabling his colleagues to perform even greater miracles in the field of plastic surgery. . . .

The "doctors' " room was as friendly as its owners. The chairs had comfortable arm-rests and seats and backs of multi-striped webbing. The floor was green, and the pale primrose walls accentuated the opal colours of the only picture, an oil painting of the Tukituki River, presented by a grateful patient. Mrs. Wilson, who looks after the domestic arrangements, served tea in flowered cups with delicious muffins of her own making. With her daffodil-yellow cardigan and cream blouse, fastened by a green and gold filigree brooch, she fitted in to the spring colour scheme exceedingly well, as did the theatre sister, whose uniform was not the usual starched hospital white, but a soft, rosy pink like that of flowering currant.

The theatre itself was a symphony in green and silver. The walls were light green and the floor was a slightly-deeper shade, matching the hand towels and linen covers on the silvery-grey trolleys. The various chromium fittings shone with a mirror brightness, and above the operating table gleamed a shadowless lamp. (It was impossible to import these lamps during the war, so a local firm essayed their manufacture with most satisfactory results.) The soap dishes, the studs on the lid of the glass container where instruments were kept in an antiseptic solution, and the tray of the autoclave, the latest equipment for sterilising gowns, towels, etc., by steam pressure, were all green.

Even the doctors wear leaf-green gowns in the theatre, and as I looked at the white satin quilt embroidered with daisies and the large wicker crib woven by a Kilbirnie caneworker specially for the Bassam so that the baby can be watched when it is not on the operating table I thought of another Cecily (Cecily Barker) who loves flowers and trees and children and whose exquisite paintings of them have made her books treasured in countless homes throughout the world. Dr. Cecily Pickerill and her distinguished husband are artists, too, though theirs is a different medium, that of living flesh and blood. Through their skill with scalpel and suture they have bestowed upon innumerable disfigured children the flowerlike beauty which should be the birthright of every child.

Mary



BAKING POWDER BREADS

By EIRENE UNWIN, *Rural Sociologist, Dunedin.*

LOAVES of sweet or plain bread, with fruit or without, are easily and simply made and form a tasty and cheap extra for those afternoon and morning teas which otherwise make such inroads into the cake tins. Many varieties of loaf can be made from one basic recipe—fruit, spice, cocoa, coffee, golden syrup, treacle, honey, nuts, wholemeal, bran, oatmeal, and wheatmeal can all lend variety.

LACK of loaf tins need not be an obstacle. Any tin that has no rim round the inside of the top edge and the sides of which do not slope in may be used. Tins which have contained fish, meat, jam, or tinned fruit, if they have been opened with a smooth-finishing tin opener, all make excellent loaf tins—in fact, a tall, round tin makes a loaf that cuts into most attractive round slices. If a straight-sided tin is being used, it is as well to cut a piece of paper to fit inside the bottom and to grease over this when greasing the inside of the tin; that helps to ensure that the loaf will come out easily. Small or medium-sized loaf tins are most satisfactory; too large a tin lengthens the cooking period and tends to dry out the loaf.

Loaves may be baked or steamed. If they are to be steamed, it is a good idea to use a tin with a lid, avoiding the bother of having to find a means of covering the loaf tin. The saucepan in which the covered tins are placed should, of course, have a lid on to keep the steam in. If the tins used are not absolutely watertight (and unless they were originally made to hold a liquid they usually are not), they should be stood on a rack in the saucepan, with water only up to the rack and not round the tin, or water may seep into the tin and spoil the bottom of the loaf. If the tin is watertight, it may be stood on the

bottom of the saucepan with the water about halfway up the sides of the tin. Be sure the water in the saucepan is boiling when the loaf is put into it, and if it needs replenishing during cooking, add only boiling water. Steamed loaves may be finished off in the oven without lids to brown the tops.

Basic Ingredients

The basic ingredients are flour, milk, and small quantities of egg, fat (not necessarily butter), sugar, salt, and baking powder. To each 3 cups of flour use $1\frac{1}{2}$ cups of milk or total liquid, 1 egg, $\frac{1}{4}$ to 1 cup of sugar, 1 to 3 tablespoons of melted fat, 1 teaspoon of salt, and 6 level teaspoons of baking powder. To this quantity 1 or more cups of fruit or nuts may be added. All measurements are level.

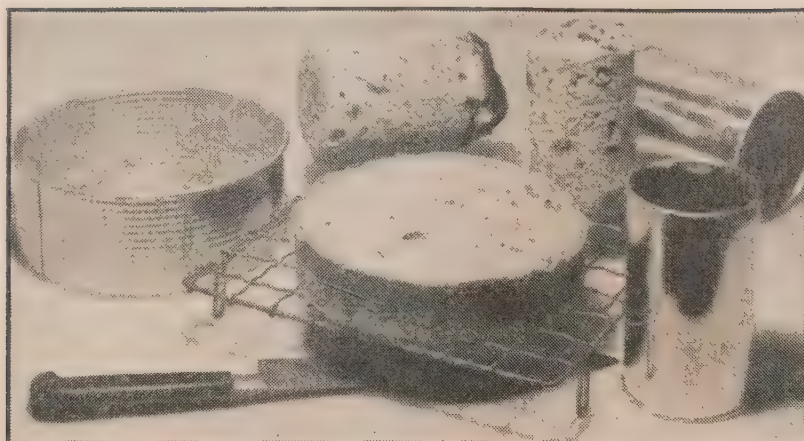
For a brown loaf replace up to about 2 cups of the white flour with wholemeal, wholemeal and bran, or wholemeal and oatmeal. If all wholemeal and no white flour is used, the resultant loaf is close in texture, and not so light or so well risen; however, an all-wholemeal loaf is very nutritious.

If brown sugar, syrup, treacle, honey, or sour milk is used, baking soda can be substituted for some or all of the baking powder; 1 cup of sour milk is sufficient acid for $\frac{1}{2}$ teaspoon of soda, and each 4 teaspoons of baking powder contains the equivalent of 1 teaspoon of soda. If a recipe uses baking soda and some such acid as sour milk or golden syrup, and it is desired to use sweet milk or white sugar instead of this acid, omit the soda and use 4 level teaspoons of baking powder for each teaspoon of soda in the recipe.

Any fruits or combination of fruits or nuts may be added to the loaves. Before using prunes soak them overnight in water, remove the stones, and cut them up; make up the soaking water with milk to the required quantity of liquid. If treacle or honey or other extra liquid is used, reduce the milk accordingly.

Photograph in heading illustration by Sparrow Industrial Pictures Ltd.

BAKING POWDER BREADS



[Sparrow Industrial Pictures Ltd. photo.]

Three varieties of baking powder bread and the tins in which they were cooked.

The tin in which a loaf is to be baked should be well greased. If a loaf tin is being used, push the mixture well up into the corners and down in the middle to help it to rise smoothly and rounded. Do not have the mixture too thick or the oven too hot, or the top surface will harden quickly and, as the loaf continues to cook, the escaping gases from the still-liquid centre will crack the crust in forcing their way out. When the loaf leaves the sides of the tin it is usually cooked, and a skewer should come out dry if the loaf is tested with it. Leave the loaf in the tin until it is cooled, turn it out, and keep it for 24 hours before cutting it.

Nut Loaf Basic Recipe

3 cups of flour	6 teaspoons of baking powder
$1\frac{1}{2}$ cups of milk	
$\frac{1}{2}$ to 1 cup of sugar (white or brown)	1 to 3 tablespoons of melted fat
1 egg	1 cup of fruit or chopped nuts
1 teaspoon of salt	

Sift the dry ingredients together and add the milk, beaten eggs, nuts, and fat. Beat them well but not too much and bake the mixture at 375 degrees F. (a moderate oven) for 1 hour. All measurements are level.

Wholemeal Nut Bread

Substitute $1\frac{1}{2}$ cups of wholemeal for half the flour in the recipe. Allow the mixture to stand for 15 minutes in the loaf tin before baking it.

Bran Bread No. 1

Substitute 1 cup of bran, 1 cup of flour, and 1 cup of wholemeal for the 3 cups of flour. Use 1 cup of sour milk and $\frac{1}{2}$ cup of golden syrup or treacle, only 1 tablespoon of sugar, $\frac{1}{2}$ teaspoon of soda, and 3 teaspoons of baking powder. Omit the nuts and fat.

Use the same method, or mix the sugar, salt, and egg, add the golden syrup dissolved in milk, then stir in

the dry ingredients. Bake the mixture at 350 degrees F. for 45 minutes.

Bran Bread No. 2

2 cups of bran	1 egg
1 cup of wholemeal	1 teaspoon of salt
1 cup of flour	2 teaspoons of baking powder
$1\frac{1}{2}$ cups of sour milk	1 teaspoon of soda
$\frac{1}{2}$ cup of brown sugar	

Use the same method, or beat the egg and add the sugar, sour milk, and soda, then the dry ingredients mixed together. Let the mixture stand in the loaf tin for $\frac{1}{2}$ hour before baking it at 375 degrees F. for 1 hour.

Oatmeal Bread No. 1

Make in the same way as wholemeal bread, using $1\frac{1}{2}$ cups of oatmeal and $1\frac{1}{2}$ cups of white flour. Fruit instead of nuts improves this bread, prunes being especially good.

Oatmeal Bread No. 2

$1\frac{1}{2}$ cups of wholemeal	1 cup of cooked oatmeal (left-over porridge)
Milk as required	
5 teaspoons of baking powder	2 tablespoons of golden syrup
2 tablespoons of melted fat	1 teaspoon of salt
1 egg	

Mix the dry ingredients together and add the golden syrup, beaten egg, melted fat, and oatmeal. Add milk to make a rather stiff mixture—about $\frac{1}{2}$ cup, depending on the consistency of the oatmeal. Let the mixture stand for 15 minutes before baking it for 45 minutes at 375 degrees F.

Fruit Breads

Substitute raisins, sultanas, currants, dates, figs, or soaked prunes, apricots, or peaches, or a mixture of these, for the nuts in the basic recipe, or use fruit and nuts. Fruit or nuts may also be added to any of the plain recipes.

Two tablespoons of candied orange peel or preserved ginger are a tasty addition to prune bread; marmalade or the peel from marmalade can be used instead. Use the prune soaking

water, made up to the right quantity of liquid with milk, instead of all milk.

Steamed Boston Brown Bread

1 cup of wholemeal	$\frac{1}{2}$ cup of golden syrup or treacle
1 cup of wheatmeal	
cornflakes or crumbs	$1\frac{1}{2}$ teaspoons of soda
2 cups of sour milk	$1\frac{1}{2}$ teaspoons of salt
1 cup of white flour	

Make in the same way as nut bread. Fill greased moulds two-thirds full, cover them closely, and steam them for $3\frac{1}{2}$ hours. One cup of floured raisins may be added if desired.

Steamed Wholemeal Bread

3 cups of wholemeal	1 cup of golden syrup
1 cup of flour	1 teaspoon of salt
$2\frac{1}{2}$ cups of sour milk	$1\frac{1}{2}$ teaspoons of soda

Use the same method as for nut bread. Fill a greased mould two-thirds full, cover it, and steam it for 4 hours.

Peanut Butter Bread

Substitute $\frac{1}{2}$ cup of peanut butter for 1 cup of nuts in the nut bread recipe. Cream the peanut butter and sugar, or blend the peanut butter with the flour first.

Spice Bread

Add up to 2 teaspoons of spices to the nut bread recipe in combinations such as the following: 1 teaspoon of ginger, $\frac{1}{2}$ teaspoon of cinnamon, and $\frac{1}{2}$ teaspoon of cloves; $\frac{1}{2}$ teaspoon of cloves, 1 teaspoon of mixed spices, and $\frac{1}{2}$ teaspoon of ginger; or 1 teaspoon of cinnamon, $\frac{1}{2}$ teaspoon of cloves, and $\frac{1}{2}$ teaspoon of mixed spice or ginger.

Especially when using ginger, golden syrup instead of sugar (and slightly less milk) gives "that little extra something" to spice loaves. Nuts or fruit may also be used.

Chocolate Bread

Add 2 tablespoons of cocoa and 1 teaspoon of vanilla to the nut bread recipe.

Lemon Loaf

Add the grated rind and juice of a lemon and use not less than $\frac{1}{2}$ cup of sugar. Use $\frac{1}{2}$ teaspoon of soda and 4 teaspoons of baking powder, and reduce the milk a little. Brown sugar could be used but golden syrup or treacle would probably mask the flavour of the lemon.

Other Bread Recipes

Here are some other types of bread not using the same basic recipe:—

Raisin Loaf

$1\frac{1}{2}$ cups of water	1 cup of sugar or less
$\frac{1}{2}$ lb. (1 cup) of raisins	$\frac{1}{2}$ oz. (4 level teaspoons) of spice
$\frac{1}{2}$ oz. ($\frac{1}{2}$ tablespoon) of fat	$\frac{1}{2}$ lb. ($1\frac{1}{2}$ cups) of flour
1 teaspoon of soda	

Mix the water, raisins, fat, spice, and sugar in a saucepan and boil them for 10 minutes. Allow the mixture to cool thoroughly, then stir it into the sifted flour and soda and bake it in greased tins for 1 to $1\frac{1}{2}$ hours. Begin at 450 de-

BAKING POWDER BREADS



Ingredients and utensils for making a steamed wholemeal loaf to be cooked in the billy. [Sparrow Industrial Pictures Ltd. photo.]

degrees F. (a fairly hot oven) and finish cooking in a moderate oven.

Ginger Bread

- | | |
|---|----------------------------|
| 1 cup of sugar | 1 teaspoon of cinnamon |
| $\frac{1}{2}$ cup of dripping or soft fat | 4 cups of flour |
| 1 cup of treacle | 1 teaspoon of soda |
| 1 cup of sour milk | 1 tablespoon of hot water. |
| 1 tablespoon of ground ginger | |

If using sweet milk use $\frac{1}{2}$ teaspoon of soda and 2 teaspoons of baking powder.

Cream the fat and sugar. Dissolve the treacle in the milk and add it alternately with the sifted flour and spices (and baking powder if used). Last add the soda dissolved in hot water. Bake the mixture in a greased tin in a hot oven.

Brown Loaf No. 1

- | | |
|--------------------------------------|-------------------------------|
| $1\frac{1}{2}$ cups of wholemeal | $\frac{1}{2}$ cup of sultanas |
| $\frac{1}{2}$ cup of bran | 1 teaspoon of soda |
| 2 tablespoons of warmed golden syrup | 1 breakfast cup of milk |

Mix the bran, wholemeal, and sultanas. Stir in the syrup and finally the soda mixed in the milk. Steam the mixture for $1\frac{1}{2}$ hours or bake it.

This mixture is the right quantity for three baking powder tins, in which case it should be steamed with the lids on.

Brown Loaf No. 2

- | | |
|--------------------------------|------------------|
| 2 cups of sugar | 2 cups of water |
| 2 tablespoons of butter or fat | 1lb. of sultanas |

Boil these in a saucepan for three minutes, cool them, then stir in the following:

- | | |
|---------------------------|-----------------------------|
| 4 cups of flour | 1 teaspoon of soda |
| 1 teaspoon of mixed spice | 1 teaspoon of ground cloves |
| Pinch of salt | |

Bake the mixture for two hours in a slow oven (350 degrees F.) in two tins.

Brown Health Loaf

- | | |
|------------------------------------|---|
| 1 large breakfast cup of flour | 1 dessertspoon of treacle or golden syrup |
| 1 large breakfast cup of wholemeal | $\frac{1}{2}$ teaspoon of salt |
| $\frac{1}{2}$ cup of hot water | $\frac{1}{2}$ cup of milk |

Mix all the dry ingredients thoroughly in a basin. Dissolve the treacle in the hot water and when it is cold add the milk. Then add all the liquid to the dry ingredients, mix them well to a light dough, put it into a cake tin covered with a lid, and bake it in a moderate oven for $1\frac{1}{2}$ hours.

Banana Bread

- | | |
|-------------------------------------|--------------------------------|
| $1\frac{1}{2}$ cups of sifted flour | $\frac{1}{2}$ teaspoon of salt |
| 1 teaspoon of baking soda | cup of fat (2oz.) |
| 1 teaspoon of cream of tartar | cup of sugar |
| | 2 well-beaten eggs |
| | 1 cup of banana pulp |

Mix and sift all the dry ingredients except the sugar. Cream the fat well, beat in the sugar, and add the eggs, mixing well. Mash ripe bananas with a silver fork as soon as they are peeled (three to four ripe bananas yield 1 cup.) Add the flour alternately with the banana pulp, mixing well after each addition. Bake the mixture in a greased pan in a moderate oven (350 degrees F.) for 1 hour or until it is done.



[Sparrow Industrial Pictures Ltd. photo.]

Any fruit or combination of fruits may be added to the basic recipe.

A PICNIC BAG FOR THE CAR

By EVA TOPPING, Rural Sociologist, Auckland.

A SNACK by the roadside is an enjoyable and refreshing incident on a long, tiring motor trip, but often it takes more time to gather dry wood, light a fire, and boil a billy than can conveniently be spared. Thermos flasks and packages of food provide a quick means of satisfying the need of a cup of tea and a bite to eat. A fitted picnic basket is a splendid possession, almost in the luxury class these days, for they are very expensive to buy. Such hampers are usually more elaborate than necessary for light refreshments and, being bulky, may take up room which is needed for parcels of goods or luggage. A bag holding flasks, cups, sugar, milk, and food containers is perhaps more suitable and convenient for these occasions. Directions are given in this article for making and fitting up a smart and compact bag of this kind.

A GOOD, sturdy material is needed for the bag; white or green duck, light awning, and deckchair canvas in a plain colour or vari-toned stripes are all excellent. Servicemen's discarded kit-bags would make the bag very well, either left in their natural colour or dyed at home with commercial boiling dyes. If the kit-bag material is left undyed, bright bindings and trimmings of braid or strips of oil baize would make the finished picnic bag attractive.

The edges of the bag must be bound, as material of the necessary strength is too heavy to hem successfully. Cotton bias binding is not recommended, as it is usually too light in weight. Narrow fancy braids, webbings, fine leather, wash leather, and wool braid are suitable. The narrow wool braid (sometimes called llama braid) of which Boy

Scouts' shoulder flashes are made is procurable at some haberdashery counters and is very useful; it is strong and easily manipulated on curves and was used on the bag illustrated. Four small pieces of leather, strong but soft enough for the machine to stitch through, are needed to attach the handles to the side of the bag. Good pieces cut from discarded leather articles such as dress belts, shopping bags, coats, and heavy gloves might be used if no scraps can be obtained from a leather merchant.

Items for Fitted Bag

Two thermos flasks, four plastic cups, a bottle for milk with a tight-fitting cork or cap, a small jar with metal or plastic screw-on lid for sugar, a tin for food, and two teaspoons complete the



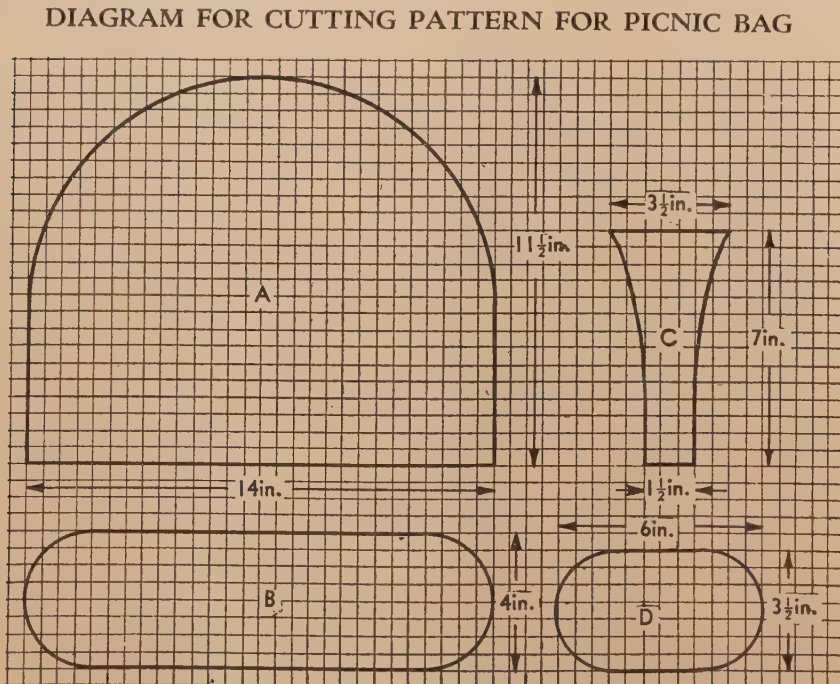
[Sparrow Industrial Pictures Ltd. photo.]
The bag packed, showing leather tabs by which handles are attached.

list of items. The cups can be all of one colour if that is preferred, but it is really better to have them in four different shades if they are available. There is then no bother about which cup was used by whom if they are needed again later during the journey. The milk bottle should be flat; a large medicine bottle or an oyster bottle is the right shape for packing easily. Small peanut butter or chutney jars make good sugar basins. The tin should be square, not round; those sold at about 1s. 3d. for baking and packing cakes for Britain are just the right size. Paint the tin, the top of the cork, and the lid of the jar in bright enamel to match the binding or one colour of the bag. For a white or natural-coloured bag, binding of emerald green, cups of blue, scarlet, orange, and white, with tin and covers painted green or scarlet would be bright and attractive.

Materials required to make the bag are:—

- 1 yard deck chair canvas 18in. wide; if other material is being used, calculate on equivalent amount.
- 4 yards llama braid or other binding material.
- 4 heavy metal rings or 8 large curtain rings.
- 4 pieces leather about 3in. x 1in.
- 1 piece stout cardboard approximately 14in. x 4in.
- 1 piece material, 14in. x 4in. (oil baize, plastic, unbleached calico, casement material, etc.) for covering base.

Matching cottons and strong thread.



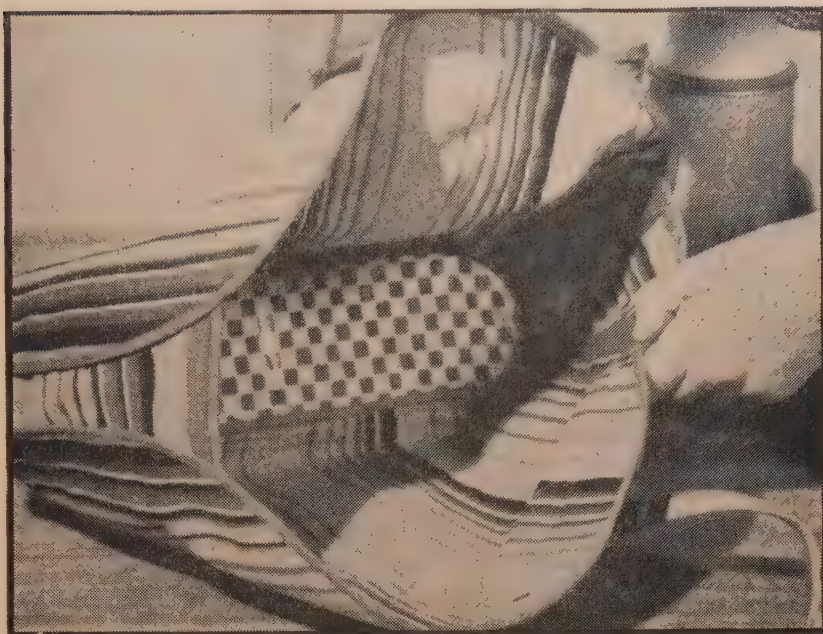
Scale: 2 squares = 1in. A—Side; cut 2. B—Base; cut 1, 1 lining, 1 cardboard.
C—End; cut 2. D—Flap fastening; cut 1.

Cutting and Making the Bag

Follow the diagrams and cut the shapes in paper as shown before cutting the canvas. Cut the piece of cardboard to the shape of the base, but $\frac{1}{4}$ in. less all round. Cut lining for the base to the same size as the canvas, unless it is of oil baize, when it should be the same size as the cardboard. First bind round the curved edge of the sides and the straight top edge of the ends; place the braid on the inside of the bag and machine close to the edge; trim the raw edge of the canvas, turn the braid over, pull it well down, and stitch close to the edge of the braid; bind the flap for the fastening in the same way. Place the flap in position on one side and machine round the braided edge on the same line as the previous stitching and across the centre, following the line of the top of the bag. Take the two pieces for the handles and fold in the raw edge; lap the selvedge over, thus making the handles about $\frac{1}{4}$ in. wide by 18 in. long. Stitch down the selvedge line and close to both folded edges. Sew on rings at either end, using two curtain rings at each point for extra strength if heavy rings are not procurable. Stitch firmly by hand with a stout needle and strong thread. Take one leather tab, slip through the ring, and fold over; set the tab in place on the side of the bag and stitch firmly by machine. Pull the ends of the thread through to the back of the work and tie securely. Repeat with the other three ends of the handles.

Now lap the sides over the two end pieces and stitch into place, keeping the stitching on the line already on the braid so that the second rows are not noticeable. Sew the bag to the base, making a single seam on the wrong side. Ease the bag slightly on to the base at the curved ends to make a neat-fitting seam. Neaten the four side seams by covering with braid or whatever binding material is used. Stitch by hand and do not let the stitches

PICNIC BAG FOR THE CAR



[Sparrow Industrial Pictures Ltd. photo.]
The inner lining of base and end sections.

show through on the right side. With the bag still on the wrong side, turn the seam edges toward the centre and set the cardboard stiffening into place on the base. Turn in the edge of the lining and slip stitch by hand over the seam stitching. If the lining is oil baize or plastic material, it should be bound with cotton binding (or braid) by machine and then the hand stitching will be both neater and firmer. Press the bag edges with a hot iron and damp cloth.

The Fastening

If the bag can be taken to a leather goods shop to have a patent fastener

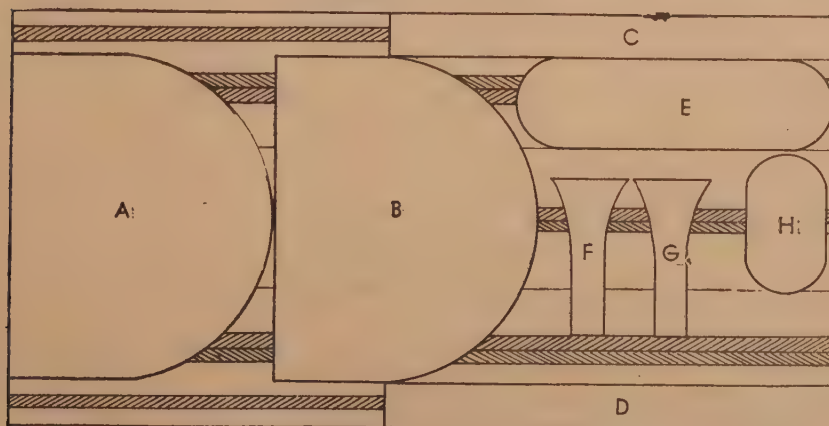
inserted on the flap, it will be given a much better and more professional finish than anything that can be done by the home sewer. However, if the fastening has to be made at home, either sew ends of braid to the bag and flap to make a tie closing, make a bound buttonhole on the flap, with button on a long shank on the bag, or sew on the largest dress fastener.

Pack the bag with the tin in the centre, on its side, a flask at either end, and the cups across the top. The milk bottle and spoons can be pushed down the side and the sugar jar will go into the end cup.

The picnic bag in the illustration is made of deckchair canvas in green, fawn, and blue. The bindings are scarlet braid, the tin is enamelled jade green, and the cups are blue, scarlet, orange, and white. The caps of the flasks are white and one has dark green top and the other is jade green. It is a good idea to have the colours on some part of the flasks different, so that if one contains stronger tea or coffee, it is easy to pick out the one required.

A piece of greaseproof paper put under the corks when the flasks are filled will keep the cork clean and the liquid hotter. As soon as possible after use, rinse out the flasks first in cold water and then in hot. Wash the corks and caps and dry thoroughly, but do not replace them to store, or the flasks will smell musty next time they are required. It is better not to put milk into the tea in the flasks, as the tea tastes much nicer if the milk is put in when the tea is poured.

PATTERN PIECES SET OUT ON 1 YARD OF 18in. WIDE DECK-CHAIR CANVAS

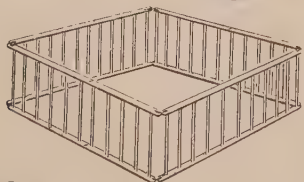
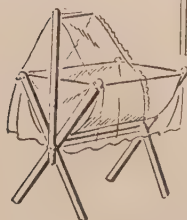
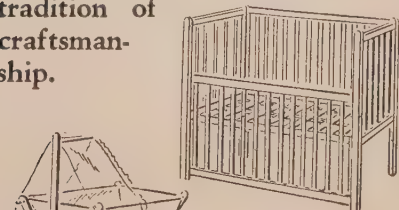


Side and flap patterns are centred on stripes. All turnings are allowed on pattern. A—Side 1. B—Side 2. C—Handle 1. D—Handle 2. E—Base. F and G—Ends. H—Flap.



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A PLAN TO BEAT THE FLY MENACE

Effective control of flies depends on:

1 **GOOD GENERAL SANITATION** to check fly-breeding. Proper rubbish collection and disposal. Sanitary and flyproof privies in rural areas. Proper storage and disposal of manure. **NOTE:** Compost heaps and manure kept in towns should be sprayed with a solution of powdered borax at the rate of 11 oz. to each 8 bushels of manure. Dissolve the borax in 2 to 10 gallons of water; or Merton's Sheep Dip, strength 1 in 80, may be used.

2 **EXCLUSION OF FLIES** by screening and keeping all food and food utensils covered from flies.

3 **DESTRUCTION OF FLIES** by
(a) Traps, fly poisons, swatters.

(b) Sprays (which usually contain Pyrethrum) quickly knock over flies, and D.D.T. may be added to kill them.

(c) Residual sprays such as D.D.T. applied to surfaces where flies rest or crawl are excellent. An oil solution of D.D.T. should contain approximately 5 per cent. of D.D.T. for residual spraying. One application might be effective for the entire season, certainly for several weeks to several months. Best places to spray or smear with the D.D.T. 5 per cent. solution are: hanging light fixtures and drop cords; edges and arches of doors; window frames and sills and other favourite haunts of the fly. Use it on the rubbish tin, too.

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KEEP THIS ANNOUNCEMENT FOR FUTURE REFERENCE

Good Gardeners do not Fear Gales

HEAVY winds can be disastrous in the flower garden, undoing the good work of months. They should be no worse than annoying, however, in gardens where proper attention has been paid to shelter and, particularly, where plants have been properly staked, as described in this article by J. P. Hudson, Horticulturist, Wellington.

IN last month's "Journal" were stated certain simple rules by following which the home gardener can be assured of an interesting and colourful display of flowers all the year round in all but the coldest districts. One of these "rules of good flower gardening" was that dead flower heads should be picked off regularly, and that aspect was dealt with in detail. Another rule was: "Where necessary, stake or support plants in ample time before they are blown over," and that rule will be taken as the main subject this month.

No part of New Zealand is immune from gales, which may blow up at any time of the year, and, though gardeners are incurable optimists, the only ones who enjoy the fruits of their labours are those who make proper preparations for protecting plants from the wind.

Protection can be provided in two ways: By planting shelter and by adequate staking. The planting of shelter is a long-term policy, but one that always pays. It is only necessary after a gale to glance into sheltered and unsheltered gardens to see the difference that can be made by a generous hedge or row of shrubs or trees. Gardeners who lack proper shelter are recommended to read the series of articles on this subject by M. Sutherland, recently published in the "Journal."

Shelter will break the force of the storm, lead to much pleasanter conditions in the garden, and prevent a great deal of the leaf and flower scorching often caused by high winds, but many flowers need proper supports even in a sheltered garden. There are, of course, plenty of plants that never need a support, but some of the most popular flowers have been bred for vigour and size of bloom without any compensating increase in the size and strength of the anchorage system, with the result that well-grown plants are incapable of standing up to the buffeting of the wind and must be supported.

In a well-staked border all the plants should be secure against the weather, yet no stakes or supports should be visible when the plants are fully developed—a high standard, but one at which every gardener should aim. The artistic appearance of a border can easily be spoilt by over-staking and using supports which are unsightly all through the season.

Size of Stakes

The commonest mistake is to use supports that are far too long and overtop the flowers even when the plants are fully grown. That can be avoided by having an assortment of stakes of various sizes and selecting for each plant stakes of a suitable size. That will vary between one species and another and will also depend on the plant's point of weakness. Wind causes some flowers to swing from side to side, pivoting at ground level, which pulls or injures the roots or even causes the main stem to snap off at the base. Wind rocking can be overcome by relatively-short stakes to which the main stem is tied, and this type of support is all that many herbaceous and bulbous plants require.

Some herbaceous plants are not liable to wind-rocking or going over at the base, but wind commonly causes



Balsam (*Impatiens*) is a valuable perennial plant worth a place in every garden in the milder coastal districts which never experience more than a touch of frost. It produces an abundance of flowers, each 2in. or more in diameter, with pearly-pink petals of a most beautiful texture. The flowers, produced almost all the year round, are rather short stalked but are ideal for arranging with others in small bowls and flower rings. The seed pod is interesting, splitting with explosive violence when ripe, especially if touched by hand, and scattering seeds in all directions.

flowering branches to tear away from the main stem or flower spikes to snap off. In such cases a much taller type of support will be required to protect all the flowering system of the plant.

Types of Supports

In general, the type of plant which needs protection mainly at ground level to prevent wind rocking can best be supported by stakes driven firmly into the ground, and these stakes usually need not extend more than about half to two-thirds of the way up the main flowering stems when the plants are fully grown. On the other hand, plants on which the individual flower stems need support are best staked with bushy branches that extend to within an inch or two of the height of the fully-grown plants.

Whichever system is used, it should preserve the natural symmetry of the plants as far as possible and not result in ugly, bunched-up specimens.

Straight stakes should range in size from 18in. to 4ft. 6in. long and from 3/4in. x 3/4in. to 1in. x 1in. in section. Straight-grained boxwood carefully split is suitable for the smaller ones, made more resistant to rotting by being dipped in creosote or wood preservative, but sawn stakes of hard-

STAKING IN THE FLOWER GARDEN . . .

wood (jarrah) are best for the large ones needed for delphiniums, chrysanthemums, and other heavy-headed flowers. Though expensive, hardwood stakes last many years and are a good investment in the long run. They can be painted dark green to make them less conspicuous.

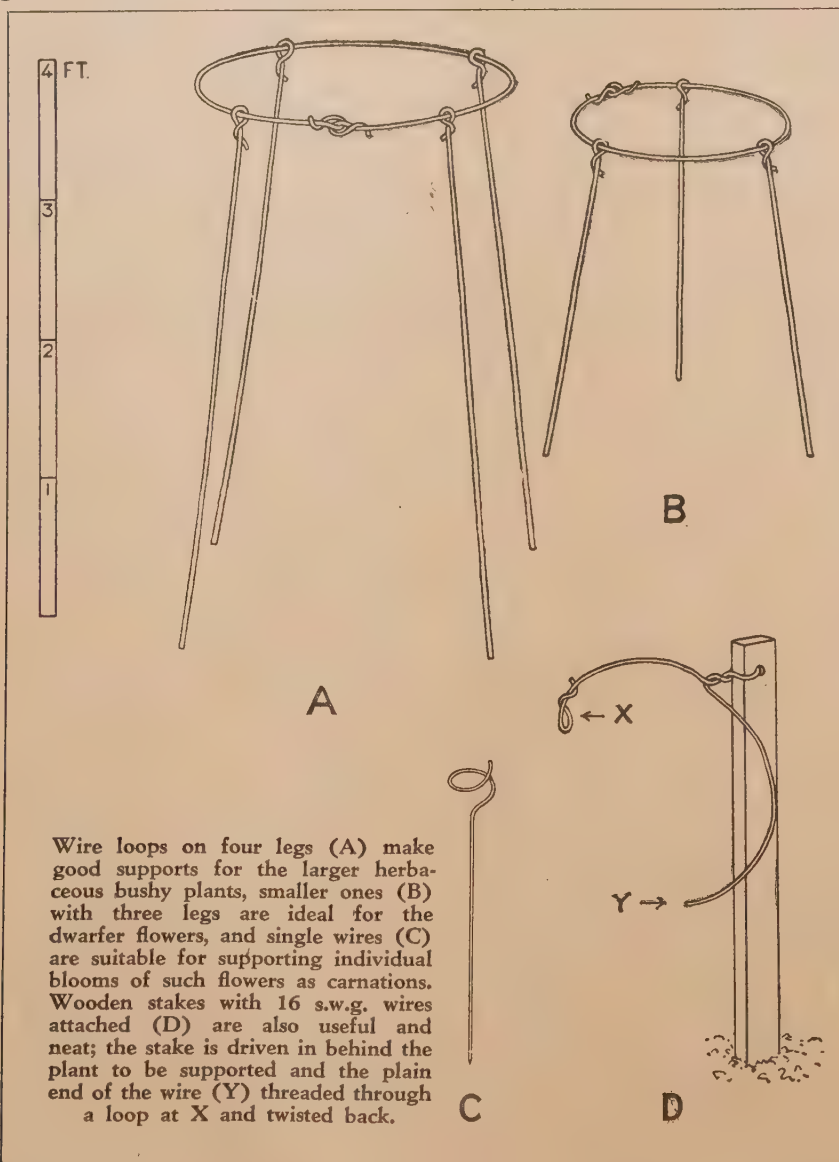
Manuka stakes, though less sightly, are serviceable and cheaper. They should be pointed for driving, but it is best to make a crowbar hole into which to put these stakes so that only a few blows are needed to drive them home, instead of driving them in from the surface. Bamboo canes also make ideal plant supports, but the larger sizes are hard to get and very expensive. Bamboos grow well in parts of New Zealand and there might be a good demand for New Zealand-grown

bamboos for garden use if a high-quality, lasting type could be marketed.

Whichever type of stake is used, it should not be driven in too near the plant for fear of injuring the root system, and each stake should be made secure by driving it well down into the subsoil. One stake driven in behind each plant may give sufficient support in sheltered places, the main stems being looped back to the support. If that is insufficient, two stakes may be used, one on each side of the plant, or, in the most exposed places, three stakes to a plant, one behind and one to each side. Where more than one stake is used they should usually be driven sloping slightly away from the plant to avoid any bunching effect and the strings can be crossed from

stake to stake to give full support to the stems, which remain free in the space enclosed by the strings. However, it is a good idea to train and tie one stem in front of each stake to hide it from view. Further strings can be added as the plant grows in height. The string should be knotted tightly on to each stake to prevent it from slipping down.

Raffia, which should always be soaked in water immediately before being used, is suitable for tying single stems to small stakes, but not for large plants or for stringing between stakes. String is the best material to use for this work and, as it is used only once, a cheap, fairly-thin, but strong type is



A neat system of staking annuals and short, bushy perennials, using the stake and wire loop shown in D below. After being used the wire loop is untwisted.

required, preferably coloured green to be as inconspicuous as possible. Gardeners overseas can buy a string of this type, but in New Zealand a string really suitable for garden use is lacking. The binder twine which is the only available alternative is heavier than the gardener really requires and too expensive for general garden use.

Plants with a bushy habit that require staking well up the flower stems can best be supported with branches of the pea-stick type. Manuka, birch, and many other woods are suitable, and even dead branches of broom can be used quite well. Bushy stakes are not usually used a second time, as the fine twigs soon snap off and the advantage of the bushy habit is lost. This method of staking is very suitable for heleniums, larkspurs, gypsophila, rudbeckias, many annuals, such as viscarias, and other plants with a relatively-sprawling habit.

WORK IN THE FLOWER GARDEN

A third system of staking is the use of prepared supports made from 8 s.w.g. fencing wire, bent to shape as shown in the illustration on the opposite page. Wire loops with four legs are used for staking large clumps of plants, smaller loops with three legs for plants of medium size, and single pieces of wire with a twist in one end for supporting individual blooms such as carnations. Fencing wire can readily be twisted to shape with a pair of pliers if first made red hot in a gas ring or fire.

Alternatively, 16 s.w.g. galvanised iron wire can be used in place of string as shown, the wire being attached permanently to a wooden stake. All these systems using wire are neat, tidy, and relatively inconspicuous.

Staking is the forfeit which must be paid for growing certain types of flowers. Whichever system is used, the keynote should be to stake early (it is too late when the plants have already been flattened by a gale), securely, and yet inconspicuously, leaving the plants looking quite natural. The criterion of good staking is a garden undamaged after a gale yet with very few strings or stakes showing.

Garden Work for February

Annuals of many kinds, sown now in the cooler districts, will winter as small plants and make a worth-while display in the spring.

Ashes of various sorts rapidly accumulate in most households and have to be disposed of. Wood ashes are a valuable source of plant foods, especially potash, and where wood is the main fuel used for domestic heating the ashes should never be put in the dustbin or wasted. Instead, they should be stored in a dry place and applied to the soil whenever it is dug over; put day by day on some part of the garden not carrying a crop, and allowed to wash into the soil; or, best of all, put on the compost heap each day. The lime in the ashes will benefit the compost and the plant foods will ultimately be returned to the soil when dressings of compost are put on the garden. Wood ashes should not be allowed to accumulate in some odd corner open to the weather, as rain will dissolve and wash out most of the valuable ingredients, which will then be wasted. It should rarely be necessary to buy potash fertilisers in households using wood as the main fuel if the ashes are used in this way.

Coal ashes, on the other hand, should never be used in the garden. They contain practically no plant foods but may contain a dangerous amount of boron, sufficient to cause damage to plants. Though boron is an essential plant food, it is required in only very



Stakes should be inconspicuous yet strong enough to support the flowers in a gale. Stakes which overtop the flowers when plants are fully grown look very unsightly.

small amounts and regular dressings of coal ashes could possibly build up the boron in the soil to a dangerous level. The dustbin is the best place for coal ashes.

Bowls of bulbs in flower in the house in spring always make a welcome addition to the display of pot plants and offer a reminder of the bulbs which will be flowering in the border a little later on. Specially-prepared bulb fibre, sold by the seedsman, should be used when bulbs are put in bowls which have no drainage holes, as soil goes sour under such conditions, but bulbs can also be grown perfectly well in ordinary plant pots, using the potting soil described in detail in the "Journal" for July, 1947, and lachenalias, freesias, and the small bulbs in general will grow much better in soil than in fibre. After potting stand the bowls or pots, or sink them in the soil to the rims, in the coolest, shadiest place available for about six weeks, watering them from time to time and never letting the soil dry out. It is a good plan to cover the pots with old sacks or a few inches of sand or old fine cinders; this top layer helps to keep the pots cool and reduces drying out to a minimum, while the added weight prevents the bulbs from lifting themselves out of the soil as their roots grow. All the flowers in a bowl are rarely at their best at the same time; that can be overcome by planting all the bulbs about 3in. apart in boxes, growing them in the usual way, and then digging them out and potting them up into bowls when the flower buds are showing clearly, matching the plants chosen for each

bowl. Rather surprisingly, the bulbs do not seem to resent being transplanted in this way while in full growth, but nevertheless care should be taken to dig them out of the boxes as carefully and with as many roots as possible.

Bulbs for spring flowering as a rule should be planted as early as possible. Early planting does not necessarily mean earlier flowering, as the varieties flower in roughly the same order and at about the same dates each season, whether planted relatively early or late. But earliness of planting does affect the size and quality of the blooms, as the earlier-planted bulbs will develop a larger root system, better capable of producing large flowers and leaves, than those planted later. A succession of flowers should be ensured by planting a range of varieties and not by planting one variety at intervals. Apart from the always popular tulips, narcissi, hyacinths, freesias, and lachenalias (the last two will not stand very heavy frost), ixias and Dutch iris should also be more widely planted to extend the bulb season into early summer. *Freesia Burtonii*, a great improvement on the older types, has very fragrant, large flowers of beautiful form and texture. It cannot be raised true-to-name from seed.

Chrysanthemum disbudding is the removal of unwanted flower buds, usually the smaller ones, when they are not larger than about pea size, by pushing them gently sideways until they drop off. That operation results in larger flowers, as the removal of some of the buds means a better sup-

WORK IN THE FLOWER GARDEN . . .

ply of food for those that remain. On the other hand, heavy thinning of buds tends to shorten the total flowering period of any plant, as there will be fewer flowers still to open after the first ones fade. Little disbudding need be done on chrysanthemums grown for garden display unless particularly fine individual blooms are wanted, in which case the central bud should be left on each stem and the side buds removed. Some single varieties are best partly disbudded by having all but the top three or four buds on each stem removed, but many gardeners take the easy way and grow chrysanthemums as "sprays" (that is, with no flower buds removed), each stem bearing a succession of flowers, though, of course, they lack the size and substance of blooms from disbudded plants.

Cuttings of shrubs and many other plants put into a frame last month to root should be looked over regularly and sprayed with water daily to reduce wilting until the plants have developed roots of their own. Cuttings usually "perk up" and the leaves become fresh and crisp ("turgid") before the new roots grow, as the callus that forms over the end of a cutting can take in some water from the soil. The first sign that the cuttings have formed new roots will be when fresh green leaves start to develop in the centres of the plants. When the cuttings have rooted the frame light should be left off and the young plants allowed to grow naturally until they can be planted out, either into an odd corner of the garden to grow on or straight into their permanent places. The sooner they are planted out the better, but it is often wise to delay until autumn rather than plant in the drier summer weather when each plant may need watering several times to keep it alive. There is a lot of truth in the old saying, "Plant when it is wet and sow when it is dry."

Everlasting flowers, though not very fashionable now, can be useful for decorating the home in the off season, especially in hilly inland districts where borders go "dead" in the winter and where there is no local shop to provide out-of-season flowers. Statice, helichrysms, rhodanthe (helipterum), and acrolinium all have flowers with hard scaly petals that retain their colours when dry. They can all be grown as annuals by sowing seed in boxes in spring, growing the plants in boxes in a frame, and then planting them out in October or November, or by sowing the seeds outdoors in the spring. The flowers should be cut when about half open, with the longest possible stems, tied in bunches, and hung upside down in a shed out of the sun and dust. The plants are left in this position until the stems have dried

and stiffened so that the flower heads will not flop over when later they are arranged in vases, in which no water should be used. As soon as the stems are quite dry and stiff store the bunches in a cardboard box until required. Honesty can also be used as an everlasting "flower," but in this case the plant is left untouched until the seed pods have ripened, as the silver "moons" for which the plant is grown are the central parts of the ripe seed boxes. Even larkspur flowers can be used by cutting the stems when the flowers are fully developed and drying them as described. The petals shrivel somewhat but retain much of their colour. Though everlasting flowers can be kept for years, it is best to grow a new lot each season and to throw away the old ones when the spring flowers come in, as they are usually full of dust by that time.

Gladioli may now be ready to lift in the northern, warmer districts, but elsewhere are only at their prime. The best time to lift them is about six weeks after the flowers have faded, and the best methods are to spread the entire plants out in shallow boxes or trays until the foliage has completely died down, or to hang them up in bunches in a dry, airy shed. The stems and leaves should not be cut off until they have quite died down and returned to the corm all the food materials which they contained when lifted.

Hedges of evergreen species should be given their last clipping before the winter. They should then be reclothed with short new shoots before growth ceases and will look neat and tidy throughout the winter. The secret of keeping hedges of reasonable size and pleasing appearance is to trim them often but lightly, as heavy cutting makes them unsightly and may spoil coniferous hedges altogether by leaving bare places which never grow again.

Hoeing is still very necessary, even though there may be few weeds to kill after the hot dry summer weather—"good weed-killing weather," as the market gardeners call it. One danger at this time of year is that the surface may become baked and hard, in which case rainfall is likely to run off the surface instead of soaking immediately into the soil, and the gardener cannot afford to waste any of the rain which does happen to fall in late summer. Another danger is deep cracking in prolonged dry spells, causing accelerated drying out of the soil and much damage to root systems. Regular hoeing between the plants, especially a few hours after each rainfall, will do much to avoid both those undesirable conditions.

Loam, the main ingredient of all seed-sowing and potting composts, should be stacked and allowed to rot before being used. Gardeners who are going to raise their own seedlings and pot plants will need loam next spring, and a supply of turves should be got in and stacked to rot. Early summer is the best time of year to dig turves for this purpose, as the soil and grass are still moist, but if the turves are collected now and are dry they should be thoroughly damped as the stack is built. Full details about choosing loam for mixing soil composts were given on page 91 of the July, 1947, issue.

Marguerites, especially the double white and the pink forms, are useful winter flowering plants for all the milder districts, but are in disfavour because they soon look so shabby if not properly attended to. In addition to having flower heads removed regularly, marguerites should either be raised afresh each year from cuttings (which root very readily) or the bushes should be cut down hard in late summer to encourage new shoots to grow and flower through the winter months. Under this treatment marguerites are quite garden-worthy plants that will repay the attention given to them. They are also useful as cut flowers, but are much easier to arrange gracefully if cut with long stems and if most of the leaves are stripped off before they are put in vases.

Oxalis leaves will now be reappearing as the bulbs start to grow after their short summer rest. The only hope of controlling this weed is to carry out a relentless war against it. Never let a leaf stay above the ground longer than a day or two, and pick out and burn any bulbs seen when the ground is cultivated. For gardeners unfortunate enough to suffer from this pest the late summer is a good time to start an all-out campaign against it.

Pot marigolds (calendulas) sown in boxes now, pricked out into other boxes when large enough to handle, and later planted out in any vacant space in the flower borders or shrubberies will provide a brilliant display of colour from mid-winter onward in all but the coldest districts. These winter-blooming marigolds seem to have larger blooms and more vivid colours than those grown in the summer. Orange and yellow pot marigolds, purple hybrid wallflowers, daffodils, and jonquils, planted together in autumn in beds in a Wellington garden last year, produced a display of colour through the winter and spring that excited quite a lot of local attention.

Schizanthus ("butterfly flower") is one of the best annuals for growing in pots in a glasshouse or sunporch. Seeds should be sown now in a pot or box,

the seedlings pricked out into small pots, and then grown on to flower next spring.

Self-sown seedlings of antirrhinums, pot marigolds, cinerarias, and many other plants can usually be found growing in the beds at this time, especially under plants where the hoe has not disturbed the ground (and, however diligent the gardener may have been in picking off faded flower heads, it seems almost impossible not to miss occasional heads, which ripen and shed their seeds). Self-sown seedlings can be watered, then carefully lifted, pricked out into boxes, and grown on into good plants for setting out later in the autumn.

Violas that were becoming straggly and were cut back last month will now have produced a number of short, sturdy shoots from each crown. These will make ideal cuttings, which will root readily if treated as described in the caption on this page.

Other Tasks for the Month

Plant **anemones** and **ranunculuses** for early flowers.

Continue to layer **border carnations** and take cuttings of **pinks** and **perpetual flowering carnations**.

More cuttings of such plants as **lavender**, **catmint**, **verbena**, and **geraniums** can be struck if required.

Cyclamen corms that were dried off in early summer and rested should now be shaken out, repotted, and started into growth.

Root a few cuttings of choice **fuchsias** in 3in. pots to make flowering plants for the windows next season.

Sow seeds of **Iceland poppies** in boxes kept in a shaded place until the seedlings show.

Reminders About Common Troubles

Caterpillars of all sorts are likely to be troublesome in the late summer, often defoliating cinerarias and playing havoc with geraniums and many other flowering plants. It is characteristic of caterpillar attacks that they come in "epidemics." For months there may be relatively few caterpillars and then the gardener may quite suddenly find hundreds, which often do much damage before steps are taken to control them. Every gardener should train himself to notice tiny holes in the leaves of plants, as these usually tell him that a new generation of caterpillars has just been hatched. An immediate application of derris or D.D.T. dust with a hand duster or of an arsenical spray should nip the attack in the bud and prevent any disfiguring damage. For flowering plants lead arsenate is best used at the rate of 1½oz. in 4 gallons of water. It is sometimes recommended that twice the quantity of hydrated lime be added to reduce the risk of the lead arsenate causing leaf scorch, especially when it is applied to young

PROPAGATING PANSIES AND VIOLAS



Violas and pansies can be increased very easily by cuttings, which will root in a shady place outdoors if the soil is moist and the plants are damped every day with a light syringing of water. They root more quickly, however, in a cold frame, and respond well to the use of rooting hormones, which cause roots to form very rapidly. Short, sturdy shoots with leaves growing close together make the best type of cuttings (centre), and long straggly shoots (left) should not be used, though they will usually root in time. A supply of short shoots can be obtained by cutting off all the straggling shoots near the centre of each plant, which will then send up a number of new shoots ideal for cuttings. The lower leaves should be removed from each cutting and the stem cut off cleanly just below a joint—for example, where a leaf joins the stem. A well-rooted cutting is shown on the right.

and tender foliage. However, it is not always easy to get small quantities of good-quality, fresh hydrated lime, which does not keep indefinitely and is usually sold only in quantities far greater than the home gardener needs.

Lead arsenate does not dissolve in water and remains in proper suspension for only a short time. When drawing it from a bucket with a garden syringe it is important to keep the liquid well stirred. As the chemical is a stomach poison it must be applied systematically over the plants to make sure that all the foliage is covered. If the application is patchy, much unsightly damage can still be done by the caterpillars before they eat enough of the lead arsenate to kill them. In fact some even seem to be able to eat round the poisoned patches.

Grass-grubs are the larvae of a brown beetle that flies at night in the early summer. The grubs, which are cream-coloured with brown heads, can be recognised at once from all other soil creatures by the fact that when seen they are always lying curled up in a half circle. They are voracious feeders, eating the roots of grass and many other plants, including small fruits and flowers. Though grass-grubs do serious damage to the roots of flowering plants, they rarely kill them, and often the poor growth of the flowers is not connected with grass-grub attack but is put down to some

other cause. Consequently no steps are usually taken to eradicate grass-grubs from the flower borders.

The most obvious damage caused by grass-grubs is to lawns, where large areas of grass may die out in late summer as a result of the depredations of this pest. Nothing can be done to save the lawn at this stage, as the grass is already dead and all that remains is to sow some more, but lawns can be safeguarded ("proofed") against grass-grub attack by dressing them with lead arsenate. This is most effective if used at the rate of ½oz. to the square yard, mixed with twice its own volume of sand evenly spread and very well watered in. The lawn should also be rolled to press the grass plants back into contact with the soil and help them to reroot. This treatment, which should be done in the early summer, is usually very effective, reducing damage to negligible proportions, as most of the young grubs are poisoned by the lead arsenate. The greatest care should be taken when using lead arsenate, as it is intensely poisonous to human beings.

When laying down a new lawn it is always worth while to incorporate 1½oz. of lead arsenate to the square yard with the top inch of soil before sowing to "proof" the lawn against grass-grub attack for four or five years, after which the dressing recommended should be applied each year.

GOOSEBERRY WHIPS

JELLIED STRAWBERRIES

FLOATING ISLAND, CHOCOLATE VARIETY

COLD SWEETS FOR HOT WEATHER

WHEN the thermometer climbs toward midsummer temperatures it is time to produce cold sweets. They are more acceptable to the family than the hot puddings served in the colder season and, as they can be prepared in the cooler hours of early morning or late evening, they are also favourites with the one who does the cooking.



By EVA TOPPING, *Rural Sociologist, Auckland.*

"FLOATING ISLAND" is a light sweet which is easily made and is usually very popular. Here is the standard recipe and some variations:—

1½ pints milk	1 dessertspoon of cornflour
3 eggs	salt
8 tablespoons of sugar	vanilla essence

Separate the eggs. Add a pinch of salt to the whites, beat them until they are stiff and dry, and fold in 2 tablespoons of the sugar. Take the yolks, 1 tablespoon of sugar, and the cornflour, and mix them to a smooth paste with a little cold milk. Heat the milk to boiling point, drop in spoonfuls of the beaten whites, and cook them for 2 to 3 minutes. Take them out with a large spoon (a slotted spoon is helpful) and put them into a serving dish. Pour the blended yolks into the hot milk and cook the mixture until it is thickened, stirring continuously. Cool slightly, add vanilla essence to taste, and pour into the serving dish gently so that the cooked whites float to the top.

In the sweet illustrated the standard recipe was varied by adding 1 tablespoon of cocoa to the custard. Chopped walnuts sprinkled over the top give extra zest to the dish.

The addition of coconut and jam gives another variety of "floating island." When they have been cooked put the whites on a flat dish or large plate. Add coconut to the custard after boiling it, pour it into the serving

dish, spread a layer of thinned jam on top, and slide the whites on from the plate. Sprinkle with coconut just before serving.

Strong coffee or coffee essence used in place of some of the milk for the custard gives another variation.

Fresh Fruit Jellies

With fresh fruits, gelatine, and sugar many delicious sweets are possible. For a plain jelly the proportions are ½ oz. (1 large tablespoon) of powdered gelatine to 1 pint of liquid. A 2oz. box of gelatine holds 5 tablespoons. Temperature affects the setting of the jelly, so, if the weather is very hot and no refrigerator or very cool place is available, use a little less liquid or more gelatine. Too much gelatine will make a tough jelly, so do not overdo the extra allowance.

Soak the gelatine in a tablespoon of cold water for 5 to 10 minutes; when it is softened pour on 1 pint of boiling water less 1 tablespoonful, making the total amount used 1 pint. Do not boil or stir much, but make sure the gelatine is thoroughly dissolved. Add sugar while the mixture is still hot so that it also dissolves; add flavouring and colouring if necessary. Strain the jelly into a wet mould and put it aside to set.

With this recipe for a basis, make fruit jellies by substituting strained fruit juice for all or part of the measured amount of water. Plum juice, red currant and raspberry, blackberry, cherry, damson, passion fruit—any kind of fruit juice can be used except fresh pineapple. This fruit when raw has a property which prevents the gelatine from setting, so pineapple juice must always be boiled before combining it with gelatine.

HEADING PHOTOGRAPH

Ice cream cake is certain to be greeted with relish, especially by the younger members of the family. Photograph by Sparrow Industrial Pictures Ltd.

COLD SWEETS FOR HOT WEATHER . . .

Many variations of the fruit and jelly sweet are possible. Small soft fruits like raspberries, strawberries, cherries, very ripe nectarines, peaches, apricots, grapes, small plums, and blackberries need not be cooked before being set in the jelly. To make the fruits hold their position, put a layer of flavoured jelly in the mould and set it aside to cool, keeping the rest of the jelly liquid by standing it in a jug in a basin of hot water or in a warm place. When the jelly mould is fairly firm arrange a layer of fruit and pour in more jelly to cover it. Set the mould aside again and repeat the process until fruit and jelly fill the mould. To turn the jelly out, dip the mould into hot water for a moment, set the dish or serving plate on upside down, and turn both mould and plate in one operation.

Here are two sweets which are made from the basic recipe:—

Strawberries in Lemon Jelly

2 tablespoons of gelatine $\frac{1}{2}$ pint of strained lemon juice
 $\frac{1}{2}$ pint of water 1 to 2 tablespoons of sugar

Soften the gelatine in 2 tablespoons of cold water and pour on the boiling water ($\frac{1}{2}$ pint less 2 tablespoons). Stir in the sugar and lemon juice. Rinse a basin or mould in cold water, pour in a little lemon jelly, and put it in a cool place to set slightly; keep the rest of the jelly warm. Hull the strawberries, wash them, and drain them well so that no moisture adheres. Arrange a layer on the semi-set jelly, pour more jelly round them, and set the mould aside to cool again. Repeat the layers of jelly and berries until the jelly is used up. Reserve some of the strawberries for a garnish, placing them, whole or in halves, round the base of the shape when it is ready to send to the table. Serve with cold custard sauce, mock cream, or ice cream.

Upside-down Fruit Salad

Make a jelly as described, using the juice of lemons, oranges, plums, passion fruit, or any other kind of fruit in season. Pour a layer of jelly into the mould and leave it to set. Arrange pieces of prepared fruit attractively, pour more jelly round them, and leave to set again. Then arrange the rest of the fruit and pour in the remaining jelly. Leave it overnight to set firmly. Garnish with pieces of fruit and, when cream can again be used without causing a feeling of guilt, at depriving more needy peoples, decorate with pipings of whipped cream.

Flummeries

$\frac{1}{2}$ oz. of gelatine 1 cup of cooked fruit juice
 1 level tablespoon of flour 1 cup of cooked fruit pulp
 $\frac{1}{2}$ to $\frac{3}{4}$ cup of sugar

Mix the flour to a smooth paste with a little cold juice. Soak the gelatine in a tablespoon of cold juice for about 5 minutes, then add the sugar, the rest of the juice, and the flour mixture. Heat it to boiling point, stirring continually, and cook it for 3 minutes. Cool it in a large basin, and when it is beginning to set beat it with an egg beater until it is thick. Add the fruit pulp and pour the mixture into a wet mould. Apricots, peaches, nectarines, berry fruits, grapes—in fact, most fruits—are good as flummary except, perhaps, bananas and pears.

Fruit Whips

Fruit whips are made with egg whites with or without gelatine. If the weather is very warm and there is no refrigerator, the recipe using gelatine will be more successful. Soft fruit may be mashed and used raw: apples and other hard fruits can be grated or stewed. The addition of some lemon juice or grated rind brings out the flavour of the other fruits.

For fresh soft fruit use the whites of 2 eggs, 1 cup of sugar, and $1\frac{1}{2}$ cups of mashed fruit. Beat the whites with the sugar until they are very stiff, fold in the mashed fruit, and pile the sweet into a glass bowl or small individual dishes.

For stewed fruit use

1 tablespoon of gelatine 2 egg whites
 $\frac{1}{2}$ cup of cold water $\frac{1}{2}$ to 1 cup of sugar,
 2 cups of cooked fruit depending on the
 pulp and juice tartness of the
 fruit

Soak the gelatine in the cold water, pour on 1 cup of hot fruit juice to

dissolve it, and set the jelly aside to cool and thicken. Whip the whites until they are stiff, add 1 to 2 tablespoons of sugar, and beat them again. Beat the cooled gelatine mixture until it is frothy, add the fruit pulp, beat again, then combine the egg and fruit mixtures. Serve whips with thin custard made with the yolks of the eggs.

Gooseberry Whip

Use the stewed fruit recipe and method for gooseberry whip. Stew the gooseberries with sugar until they are broken. Tint the whip with vegetable colouring to a very pale green, pour it into individual dishes, and set them aside to cool. Whisk an extra egg white until it is very stiff, add sugar and flavouring to taste, and use it to decorate the sweets.

Ice Cream Cake

If there is a refrigerator in the house, or if the store is near enough for ice cream to be obtainable, give the family a treat with a chocolate pudding with ice cream filling. Make the chocolate cake with

$\frac{1}{2}$ cup of butter or $\frac{1}{2}$ cup of sugar
 clarified dripping 1 egg
 2 cups of sifted flour 1 tablespoon of cocoa
 2 level teaspoons of 1 small cup of top
 baking powder milk

Cream the butter and sugar, add the egg whole, and beat the mixture well. Sift the flour, cocoa, and baking powder and add them gradually, mixing to a soft dropping batter with the milk. Bake the cake in a square tin in a moderate oven for $\frac{3}{4}$ to 1 hour.

When required, split the cake down the centre and fill it with a layer of ice cream. Put more ice cream on top, and decorate with slices of peaches, nectarines, or other fruit, fresh or preserved.

"To Live in Harmony"

TO be enthralled by a particular mountain, valley, or dearly-loved view has never been my lot, for I am not one who makes "roots."

If I had to choose between scenery and people I should unhesitatingly choose congenial company. One can be quite happy in one's own home with a blanket of fog hiding the outside world; and to live in harmony is more important to me than the material surroundings.

However, sometimes I daydream and see a farm where land and sea meet: a little cove where the changing restless sea breaks endlessly on my own beach; where I may sit and let the warm golden sand trickle through my fingers. Behind rise green paddocks and gracious tall pines. In a sunlit sheltered corner stands my ideal house with warm sunlight in every room and where I am surrounded by the people and things I love.

Yet always into this picture creeps the desire to be within easy reach of a large throbbing city with all its

facilities and those things that feed the mind—libraries, museums, art galleries . . .

R. L. Stevenson says "it is better to travel hopefully than to arrive"; perhaps he is right. Meanwhile I continue to dream of my ideal home and add new joys to the picture as the years pass.

—"Homespun," Halcombe.

ALL THESE HAVE I LOVED

*All these have I loved:
 Trees and clouds and wind-whipped
 streams;
 Star-dust; laughter; youth's high dreams;
 Bird-notes at dawn; buds wet with dew—
 All these have I loved
 And know Christ loved them, too.*

*Christ died for the world:
 Pleading at His Cross there came
 The sorrowing; unloved; and lame;
 The scorned, immortal-visioned few.
 The Lord Christ died for these—
 Shall I not love them, too?*

—Enid B. V. Phillips.

THE KITCHEN COOKING CENTRE

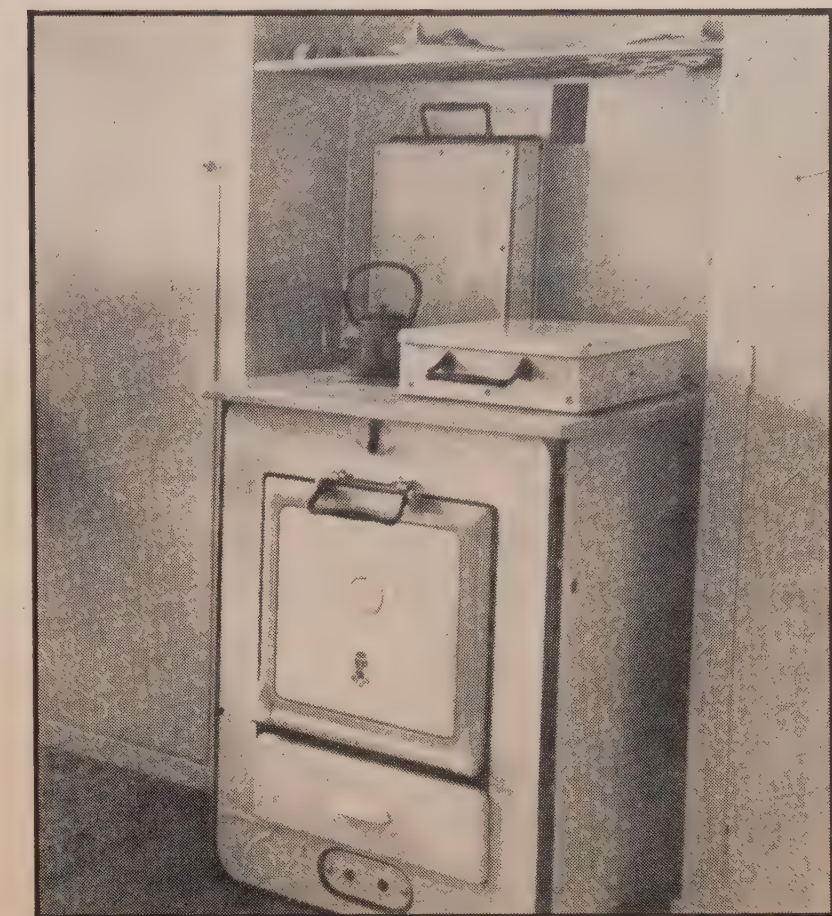
By NORMA K. METSON,
Rural Sociologist, Wellington.

THE old-fashioned range is inevitably the centre of a kitchen—black and gleaming, radiating a glowing warmth on winter mornings, and responding cheerfully to all demands made on it in rush periods. That is the idyllic picture, ignoring the endless fuel carrying, the soot, the stifling heat of the kitchen on summer days when Christmas cooking, haymakers, and visitors must be catered for, and the humouring required when the wind blows from the wrong direction. But, good or bad, a fuel stove is always a personality, something which cannot be ignored. A modern electric stove, on the other hand, is just another piece of equipment, and any temperament it displays is usually a result of the power situation and not of its own nature.

A CHERISHED memory is of a delightful cartoon showing an ultra-streamlined kitchen with a bewildered maid standing in the middle of the floor and telling her mistress: "I'm sorry, ma'am, but I can't find the stove again." Possibly there have been housewives who felt like that, looking at a new or remodelled kitchen and finding that for the first few weeks, in spite of the new facilities, their routine was hindered rather than helped by the unfamiliar arrangement of equipment.

Satisfactory treatment for all types of foods demands considerable and easily-controlled variations in cooking temperatures and conditions. In addition the main cooking appliance may be relied on for subsidiary services such as heating space and water. No ideal combination has yet been achieved; it is still necessary to balance advantages and disadvantages. Additional convenience can be obtained by the use of a wide variety of small appliances for special purposes. Discussion in this article is confined to the two common types of stoves, solid fuel and electric; the other fuels available, bottled gas and kerosene, are used in very few country homes.

The functions of the stove centre are cooking—which includes surface cooking (boiling and stewing), enclosed cooking (baking and roasting), and cooking with direct heat (grilling and toasting)—and other processes for



which heat is needed. Hot food must be dished up and served, and storage is required for the necessary equipment.

Surface Cooking

Surface cooking requires facilities for rapid heating and for maintaining an even, low temperature for slow cooking. With electricity the required variations are obtained from different sizes and total loading of units, and by the use of open coils for quick heating and solid units for even distribution and retention of heat. Standard control switches can be adjusted to low, medium, and high; on some of the latest overseas types almost continuous variation in temperature is possible with seven switch positions from which to choose. For greater efficiency the saucepans used with an electric stove should have a heavy flat base and correspond exactly in size to the elements. If they are smaller heat is wasted at the edges; if they are larger there is danger of overheating and crazing the enamel around the units. The standard stoves

at present available have three surface units, one large and two small. American types have four, one of which is usually a deep-well cooker—an insulated well in the surface of the stove with the unit at the bottom and a pan which fits into it exactly; it can be used for stews, pot roasting, deep-fat frying, and steamed puddings, and because of the insulated construction takes little current to run and is easy to keep at a constant temperature.

A fuel stove provides a large heated area where considerable variations in cooking temperature are made possible by varying the amount of fuel, the rate of burning, and the part of the surface used. The hottest area, directly above the firebox, serves as the boiling plate, while the back and sides provide a gentle, simmering temperature. With a reliable stove and satisfactory fuel good results are usual, but some experience in manipulation is necessary, especially if oven and surface heating are required together.

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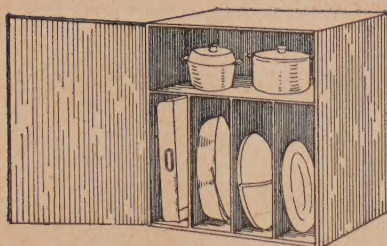
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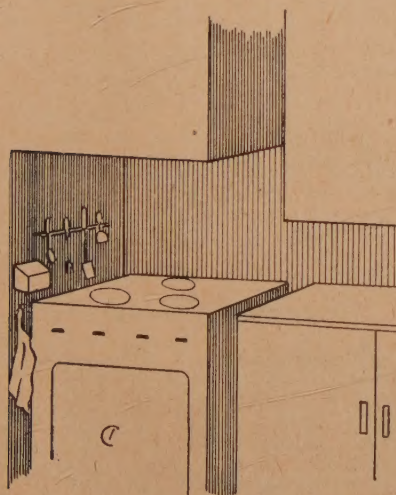


A cupboard to fit below a bench, showing a shelf for casseroles and removable vertical partitions providing storage for such articles as the frying pan and girdle.

A heat-storage fuel stove has two large surface units, each with a heavy insulated cover. One unit is kept at a high temperature for boiling and the other cooler for simmering. If vigorous boiling is not required, pans can be transferred from the hot unit to the cooler one. A slow, continuous rate of fuel consumption is maintained. Heat is stored in the ovens and hotplates while they are not in use and used when cooking is in progress. After a period of heavy use, as in the preparation of a family dinner, some time must be allowed for recovery while temperatures are built up again. Temperature adjustment is also possible by altering the air intake, which regulates the rate of combustion. An electric heat-storage stove operates on the same principle, building up reserves of heat from a low, uniform current consumption.

Oven Cooking

A satisfactory oven should heat rapidly, maintain a given temperature with little or no adjustment, give uniform cooking and even browning for baked goods, and have an easily-cleaned interior and adequate trays and racks adjustable for height. A



A stove with ventilating hood above, salt box and utensil rack on an adjacent wall, and a convenient hook for the oven cloth.

thermostat or accurate thermometer is necessary for temperature control. A thermometer records the temperature in the oven at any time; a thermostat on an electric or gas range can be set for a desired temperature and regulates the fuel supply by switching the current or gas on and off, so that the set temperature is maintained. Electric ovens can also be fitted with a timing device so that the current is turned off after a required period.

Electric ovens are usually very satisfactory if well insulated and if the correct principles of pre-heating and use of residual heat are followed. They are wasteful if heated continually to cook small quantities, but economical when whole meals—for example, roast dinners or casseroles and baked vegetables—are cooked together. The different temperatures at different levels in the oven and independent top and bottom elements make possible the cooking of several dishes at one time.

Domestic models of heat-storage stoves have two ovens for cooking, a high-temperature one for baking and roasting and a lower-temperature simmering oven which can be used for casseroles, large cakes, milk puddings, and other dishes needing slow cooking. In a fuel range the oven is always warm, but extra fuel and adjustment of dampers are necessary if much oven cooking is to be done.

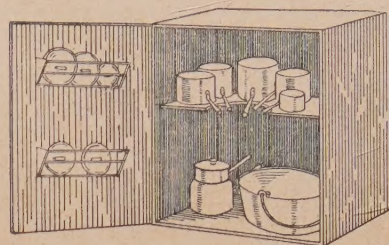
Facilities for warming plates and dishes and keeping food hot may be provided in a separate compartment, as in the plate oven of a heat-storage stove and the warming tray of an electric range, or the familiar rack above a coal stove may be used. Placing unprotected china in an oven which has just been used for cooking has been the cause of many breakages.

Some electric stoves have a separate compartment for grilling, but in most the top element of the oven is used. True grilling—cooking by direct heat—is not possible with a fuel or heat-storage stove.

Supplementary Appliances

A wide range of small cooking appliances can be used for special purposes to supplement the stove. In houses with power the electric toaster and jug are quite familiar; less usual are the waffle iron, coffee percolator, and electric roaster. Each of those incorporates its own element and, being portable, can be plugged in where required.

The pressure saucepan, excellent for speeding up vegetable cookery and in a larger size for preserving, is used on the stove like any ordinary saucepan, but saves both time and fuel. The hay-box, easily constructed at home, saves fuel but not time.



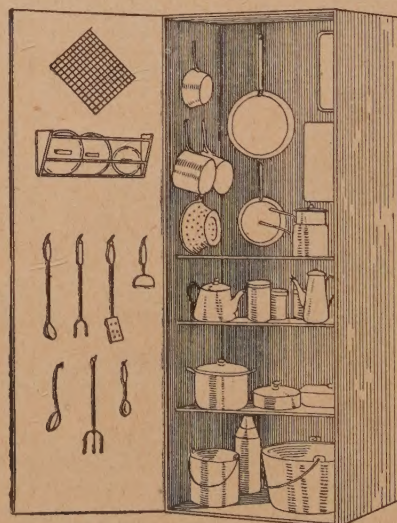
A pot cupboard with racks on the door for lids and the shelf cut away so that handles of saucepans are easily reached.

Attached water heating is usual with the ordinary fuel stove and on the newer heat-storage models. When an electric stove is used water is usually heated by electricity or possibly by a fuel-burning appliance of the chip heater type.

Installation of Cookers

A fuel range must be installed with a chimney and adequate brick insulation and will occupy about 2ft. 6in. x 4ft. 6in. Additional space is necessary for fuel storage, and a room with a fuel stove will need to be 20 to 26 square feet larger than a similar room where electricity alone is used. A heat-storage stove must have a flue and chimney.

The standard electric range now on sale in New Zealand has the oven below the hotplate and takes up 20in. x 21in. of floor space. It can be installed flush with benches and cupboards on either side. Current American types occupy about twice that area.



A tall cupboard to fit near the stove with storage for saucepans, tea and coffee pots and large utensils, and hooks on the door for small utensils used in cooking and serving.

The elements are arranged on half the top of the stove; the other half acts as a serving and work bench. The oven, and possibly a warming oven and grill, are placed below, and any remaining space is fitted with storage drawers.

Cupboards should never be built directly above an electric range; instead a ventilating hood should be provided leading steam and odours outside.

Work Surface and Storage Space

Near the stove, preferably on the left side and between it and the meal table, should be a bench surface about 2ft. x 3ft. with a heat-resistant top, to be used for serving hot foods. With the American type of range part of this is provided by the stove itself. Storage is required nearby for saucepans, frying pan, meat dishes, casseroles, serving dishes, requirements for tea and coffee making, serving and cooking spoons, small utensils, and salt, pepper, and other condiments added while food is cooking.

A full-length cupboard with hanging room in the upper section and shelves below provides convenient storage for the heavy equipment such as frying pans, while saucepans can be kept in the cupboard below bench level and serving dishes in the one above. One or two shallow, divided drawers, hooks in the back of a door, or an open rack near the stove are ways of keeping the numerous small items needed at that point.

Choice of Stove

Choice of a stove will depend mainly on availability, practicability, and initial and upkeep costs. The following summary of advantages and disadvantages may help in making a decision:—

Type of Stove	Advantages	Disadvantages
Electric	Clean Easy to use Looks well Running cost varies with local price of current	Power not available in all districts Power cuts possible No water heating Little space heating
Ordinary fuel stove	Can be used anywhere Fuel may be free or cheap Space & water heating New enamel models are not difficult to clean	Labour involved in fuelling and cleaning Constant attention required Some fire danger Heat in summer
Heat-storage fuel stove	Can be used anywhere Low fuel cost Space and water heating	High initial cost Fuel must be specially prepared

A PLEASING decorative effect can be given to the dining table by the use of crochet table-mats. They not only save laundering of linen table cloths, but the larger mats can be used as doilies.

THE materials needed to make a complete set of one large mat, six plate-mats, and six glass-mats the same as those shown in the accompanying illustration are seven balls of No. 20 mercerised cotton and a steel crochet hook size 3½.

Tension: Long trebles seven to each ¼ in. in width and each about ¼ in. deep. Solomon's knots should have each loop pulled out to about ¼ in. in length (unstretched).

Measurements: Large mat about 13 in. in diameter, plate-mats just under 8 in., glass-mats 5 in.

Abbreviations: Ch. chain; d.c. double crochet; tr. treble; sl. slip; st. stitch; rep. repeat; sp. space; rd. round; lg. tr. long treble.

A long treble is made thus: Put thread over hook twice, insert hook into st. below, pull thread through, * thread over hook, draw through two loops; rep. from * twice more, which will complete the long treble.

Glass-mat

Make 6 ch., and join into a ring with a sl. st.
1st rd.: 5 ch. (to stand for the first lg. tr. of rd.), then work 16 lg. tr. into rd. and join with a sl. st. into the top of the 5 ch. commencing rd. (17 lg. tr. in rd.).

2nd rd.: Sl. st. between 1st and 2nd lg. trs. of previous round; 7 ch. (the first 5 of which stand for the first lg. tr. of rd.), then 1 lg. tr. into sp. between next 2 lg. trs. of previous rd., * 2 ch., 1 lg. tr. between the next 2 lg. tr.; rep. from * all round, ending with 2 ch., and 1 sl. st. into the 5th of the 7 ch. which commenced the rd.

3rd rd.: 5 ch. to stand for the 1st lg. tr. of rd., * then 2 lg. tr. into the next 2 ch. sp. of previous rd., then 1 lg. tr. into the next lg. tr. of previous rd., and rep. from * to last sp., 2 lg. tr. into last sp., then 1 sl. st. into the top of the 5 ch. which commenced rd.

4th rd.: Commence Solomon's knots, which are made thus: Pull out loop on hook to length of ¼ in. thread over hook and draw through loop, then insert hook under the extra strand thus made and do 1 d.c. Note: These directions for making knots are referred to in the following instructions as "make a knot." To commence rd., * make 2 knots, miss 2 lg. tr. of previous rd., and sl. st. into top of next lg. tr., and rep. from * all round; sl. stitching the last knot to top of lg. tr. from which the first loop of rd. was made.

5th rd.: Make a knot, then secure to top of first knot of previous rd. with a sl. st., * make 2 knots, then inserting hook between loop and single strand at one side of next point, do 1 d.c.; then do 1 d.c. between loop and strand on other side of the same point; rep. from * to last point, then make 2 knots and sl. st. to top of 1st point of previous rd.

6th rd.: As for 5th rd.

7th rd.: Pull out loop and sl. st. to top of 1st point of 6th rd. Now make 5 ch., then 2 lg. tr. into 1st point, * 11 ch., then 3 lg. tr. into top of next point, and rep. from * to



end, finishing with 11 ch. and one sl. st. to top of the 5 ch. commencing rd.

8th rd.: 5 ch. to stand for the 1st lg. tr. of rd., then 11 lg. tr. into 1st 11 ch. sp. of previous rd., then continue, making 12 lg. tr. into every 11 ch. sp. of rd., ending with a sl. st. into top of 1st. lg. tr. Fasten off thread neatly.

Plate-mat

Work from 1st to 8th rds., inclusive, of glass-mat.

9th rd.: As for 4th rd. of glass-mat, but miss 5 lg. tr. (instead of 2 lg. tr.) between 1 sl. st. and next.

10th and 11th rds.: As for 5th rd. of glass-mat.

12th rd.: As for 7th rd. of glass-mat.

13th rd.: As for 8th rd. of glass-mat. Fasten off neatly.

Large mat

Commence with 8 ch. and join into a ring with a sl. st.

1st rd.: As for 1st rd. of glass-mat, but make 28 lg. tr. (instead of 16 lg. tr.) into ring (24 lg. tr. in rd.).

Now work 2nd to 4th rds., inclusive, of glass-mat.

5th to 10th rds. inclusive: As for 5th rd. of glass-mat.

11th rd.: As for 7th rd. of glass-mat.

12th rd.: As for 8th rd. of glass-mat.

13th rd.: As for 9th rd. of plate-mat.

14th to 23rd rds. inclusive: As for 5th rd. of glass-mat, but pull out loops a trifle longer if required, to keep work flat.

24th rd.: As for 7th rd. of glass-mat.

25th rd.: As for 8th rd. of glass-mat. Fasten off neatly.

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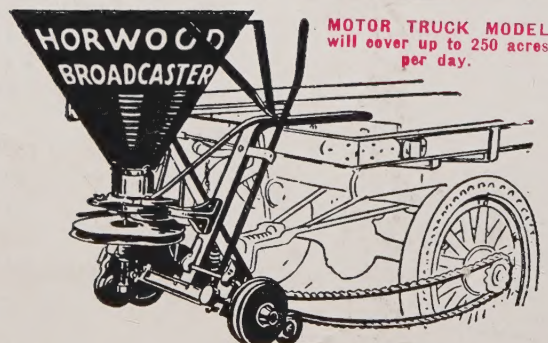
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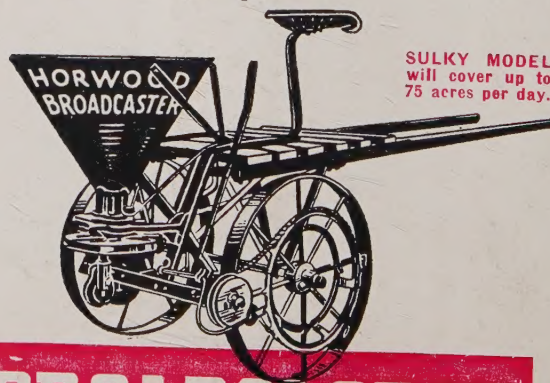


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